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mathways

second edition

3

Overview

Scope and Sequence

Index

Unit 1

Teacher's Resource Manual

Second Edition
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Overview
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Teaching Notes
Unit 1

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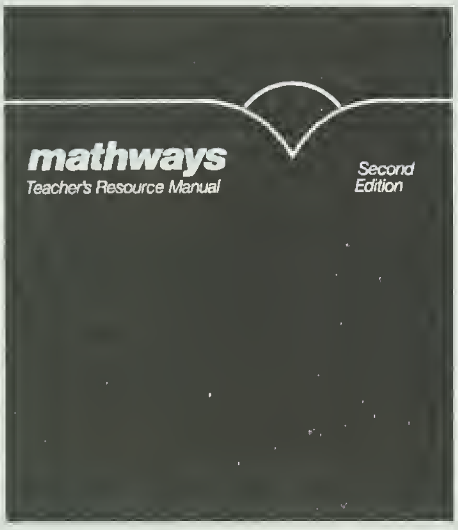
Features of *mathways 3* Second Edition
mathways 3 Second Edition gives you:

- A complete and sound approach to developing problem-solving skills in both written contexts and oral situations. Problem solving is related directly to the child's world.
- An emphasis on developing an understanding of, and mastery in, number, geometry, measurement, and graphing skills.
- A thorough development of the concept of place value, introduced and reinforced through the use of concrete materials.
- A systematic review process complemented by a variety of supplementary resources designed to meet the needs of individual students.
- A Teacher's Resource Manual designed to aid the teacher in organizing the classroom and in using the *mathways* text and support materials to meet the objectives of any curriculum and of individual students.

Components of *mathways 3 Second Edition*

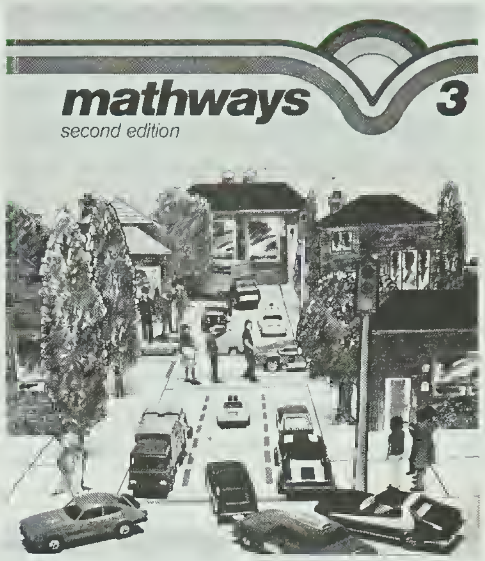
Teacher's Resource Manual

- Contains a "Scope and Sequence Chart" which classifies all concepts taught in *mathways 3* under these five headings: Number Work, Geometry, Measurement, Graphing, and Problem Solving.
- Each unit begins with a "Unit at a Glance" chart designed to assist the teacher with preparation by listing the materials and vocabulary for each section, and by listing the concepts for each lesson.
- Contains teaching notes for every lesson within a section. Each lesson consists of two parts: presenting the lesson (the teaching of the concept), and written and other activities – the first of which is the student's text page. The written and other activities provide reinforcement or extension of the concept.
- Teaching notes consist of:
  - concepts
  - list of materials required
  - suggestions on how to present the lesson in ways that make mathematics an enjoyable and relevant experience for students (Teachers should choose some, or use all, of the activities suggested here according to their students' needs.)
  - written and other activities (The first activity is always the completion of the student's page. Cross-references to relevant supplementary *mathways* materials are given here. Other activities should be assigned at the teacher's discretion to meet students' needs. Material in this section provides either reinforcement of the concept being taught, or enrichment of that concept. Enrichment activities are challenging ones designed to expand the child's thinking processes.)
  - reproduction of students' pages with answers
- Includes reproducible Program Masters for charts, graphs, and games.



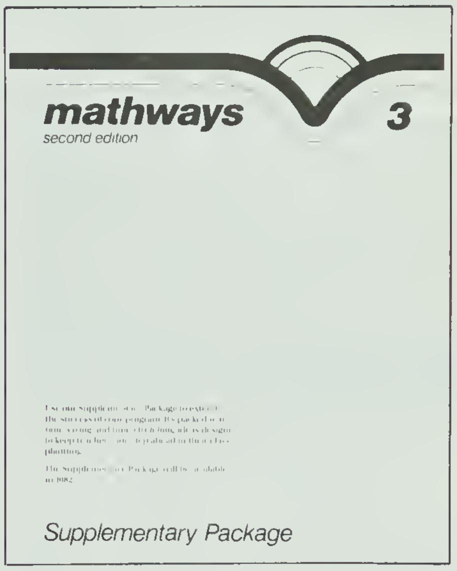
Student's Book

- Contains four units:
  Units 1-3 are core topics, Unit 4 is enrichment.
- Each lesson is divided into two parts: the *Explore* or instructional section which illustrates the concept to be taught and provides a worked example that children can use as a model, and the *In Action* section which provides exercises for the children to work.
- Four "*Check*" and four "*Practice*" pages at the end of each of the first three units provide additional exercises for the concepts taught in that unit. In each case, the "*Practice*" page covers the same concepts as the corresponding "*Check*" page. These pages can be used in a variety of ways: for review, remediation, and testing.
- The "*Further Practice*" section on pages 322 to 336 provides yet more exercises for the concepts of the first three units. Again, these can be used for remediation or review.
- The *Mathematics Dictionary* on pages 337 to 349 provides illustrated, easy-to-understand explanations of key mathematical words. Children should be encouraged to use this reference tool frequently.



Supplementary Package Items

- Reproducible Practice Masters providing additional work to reinforce the concepts taught, cross-referenced to the relevant *mathways 3* pages
- Enrichment materials designed to help the teacher meet the special needs of students
- Math bulletin board ideas
- Math games
- A test package



Goals of *mathways*

The success of any mathematics program depends ultimately upon the teacher. This Teacher's Resource Manual, the students' texts, and the supplementary materials supply the teacher with tremendous support, but only the teacher can create the kind of classroom ambience conducive to effective learning. Mathematics is relevant: it can be beautiful and it can be fun. *mathways* has been conceived and written from these beliefs.

To help students become effective problem solvers is the ultimate goal of *mathways*. A variety of problem-solving skills is taught in *mathways*. Students will acquire and apply these skills more readily when given opportunities to use them in appropriate day-to-day situations. Mathematics is a real and vital part of a child's world: in *mathways*, mathematics problems are placed in real-life situations so that children not only perceive a problem, but also perceive the necessity for solving it.

mathways facilitates the teaching of mathematics by providing the necessary resources. The Teacher's Resource Manual is the core of the program. The students' books provide excellent follow-up and support for the teacher's role: the Teacher's Resource Manual provides suggestions that will help the teacher teach mathematics most effectively and develop the most important classroom relationship — that between teacher and students.

mathways facilitates the learning of mathematics by helping children become familiar, and feel at ease, with mathematics, and by meeting students' needs. Mathematics is presented in realistic situations familiar to students. The number of activities suggested allows teachers to choose and use those that will most benefit their students. Throughout the program, certain basic activities are repeated, with adaptations to suit the concept being taught. This feature has the advantage of familiarizing students with the mechanics of the activity: they can then concentrate on grasping the concept, not on how to do the activity.

Language development is a major aim in *mathways*. From the start, children are encouraged to use the language of mathematics in realistic situations.

A balance between understanding and performance must be an aim of a mathematics program; both facets of a concept must be developed together. *mathways* achieves this crucial balance.

It is the general objective of *mathways* that, through a positive attitude toward learning, students should enjoy mathematics, develop facility in critical thinking and problem solving, and learn to discover facts for themselves. To achieve these ends, each concept is presented at three levels: discovery, directed learning, reinforcement.

Balance in content is also important in a mathematics program: number work, problem solving, geometry, measurement, graphing, logical thinking, decision making, and recording must be woven through the entire development.

Variety of approach creates interest and motivation. Any teaching procedure, however imaginative, becomes monotonous if used day after day; used as one of many procedures, on the other hand, it retains its freshnesss and appeal. Teacher-directed lessons, discovery exercises, individual study, oral and written drills, reinforcement exercises, an integrated approach, discussions, planned activities, and mathematical games are all important parts of an effective modern program.

Throughout the program, illustrations have been used to relate developmental lessons and practice activities to other subject areas and themes. This integrated approach can be used to add variety, to strengthen learning, and to transform practice into interesting, relevant activities. If the teacher plans ahead, films, filmstrips, resource books, and other teaching aids can be used to develop those themes that students find most interesting, enjoyable, and relevant to them.

Strands in *mathways:* the Spiral Approach

The presentation of the five strands in *mathways* – number work, geometry, measurement, graphing, and problem solving – is a spiral one. In a spiral approach, major concepts are presented more than once throughout the year. Each presentation is in a different context or at a different level of sophistication. This approach is consistent with learning theory: a concept is introduced, related to a real-life situation, and students then internalize the concept through practice and review. At the next presentation, the concept is extended. The spiral approach in *mathways* has several advantages:

- Concepts from one strand can be used to develop concepts in another strand. (e.g., Place-value concepts from the number-work strand are applicable to the measurement strand.)
- Spiralling increases students' interest by providing variety. However, the spiral approach in this second edition of *mathways* allows for ample reinforcement each time a concept is taught.
- Spiralling provides for a continuous practice and review process. Concepts are not learned and forgotten, but continuously used, reinforced, and extended in a variety of realistic contexts.
- Feelings of failure are minimized. A child who is having difficulty with a particular concept may find work with another concept provides a refreshing change. When the troublesome concept next occurs, the child may have internalized the concept, or may find that presentation within a different context alleviates the problem.

Problem Solving in *mathways*

Different educators would undoubtedly offer a diverse range of definitions for problem solving. There would, however, be certain commonalities among these definitions. Almost certainly these points would be mentioned. A "problem" must be understood by the solver, must be of some interest to the solver, must not be solvable by some routine procedure known to the solver, and must be within range of the solver's capabilities. With that agreement a whole host of situations fall into the category of problem solving. Word problems can be included but the field is far more extensive than this.

The importance of problem solving has been recognized for decades, and one has only to examine the literature in the field, and view the conference programs to see that problem solving has come to the forefront in the field of mathematics. It is recognized as the raison d'être for studying mathematics. Teachers have, however, often been frustrated in their attempts to help children become good problem solvers.

Having children become proficient problem solvers has remained an important but elusive goal. In 1957, George Polya wrote a searching account of why this is so. He broke the complex process of problem solving into four different phases:

1. understanding the problem
2. devising a plan of attack
3. carrying out the plan
4. reflecting back

Mathematics educators have tended to teach problem solving as a single-step process – that is, the student applies some algorithm to the data found in the problem. In other words, we have trained our students to ignore the first two phases and to plunge into a problem at phase 3. There has also been little attempt to have students reflect back – to examine their results as reasonable, to try to think of other similar problems, to create similar problems, and so on.

Because *mathways* is a problem solving series, it presents a sound development of the four phases named by Polya. The children are given a number of methods, such as the following, for helping them understand a problem (phase 1).

- Read the problem carefully.
- Tell the problem in your own words. Check to see that you have included all the information.
- Have someone else check as you tell the problem in your own words.
- Think of another problem like the one you have just read. Use smaller numbers in your problem.
- Act out the problem.
- Write the problem in your own words.

For phase 2, the *mathways* program actively teaches a number of important strategies for attacking a problem. These include

- trial and error
- thinking of a simpler example
- making a diagram
- creating problems
- reading charts and diagrams
- collecting information
- organizing information

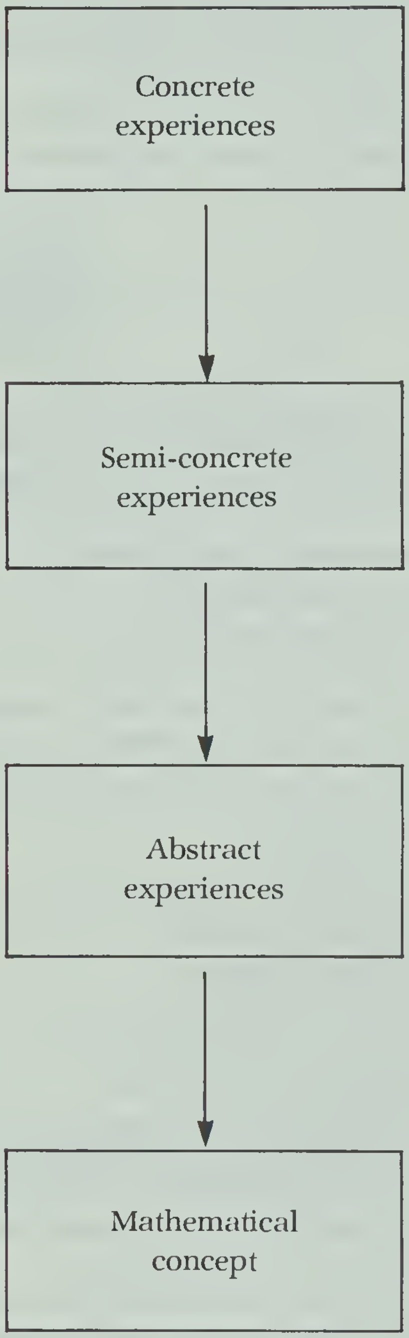
Finally, the students are encouraged to reflect back on the situation (phase 4). Do they believe their responses to be reasonable? Can they create and solve other similar problems?

To be proficient problem solvers, students must be given the language to talk and think about problems. They must also be given many opportunities to solve problems, especially from their own environment. The *mathways* text presents interesting, relevant situations for students.

With *mathways,* proficiency at problem solving becomes an enjoyable as well as attainable goal.

Concrete Materials

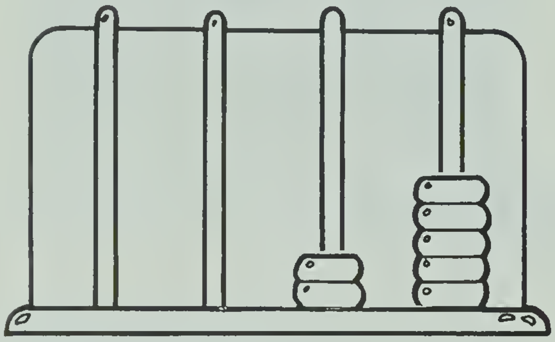
There is a general consensus among educators that concrete experiences aid a child in grasping any mathematical concept. Concrete experiences are the first in the continuum of experiences leading to the internalization of an abstract concept.


Concrete experiences
Semi-concrete experiences
Abstract experiences
Mathematical concept

The materials listed here are designed to help provide these essential concrete experiences: the importance of these materials to the planning and execution of a successful mathematics program cannot be overemphasized.

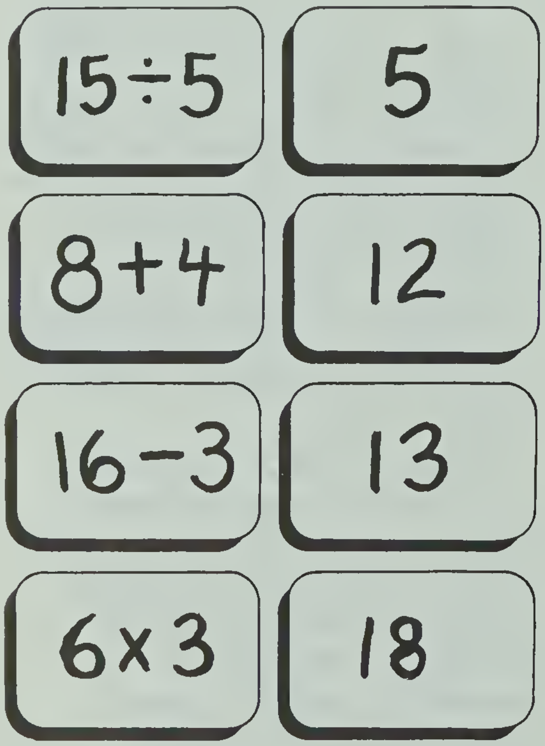
In addition to the materials listed here, other readily available materials (such as magazines, calendars, coloured stickers) are listed, as required, in the Unit at a Glance.

- ***Abacuses***
  If these are not available, paper models can be reproduced from Program Master 27.

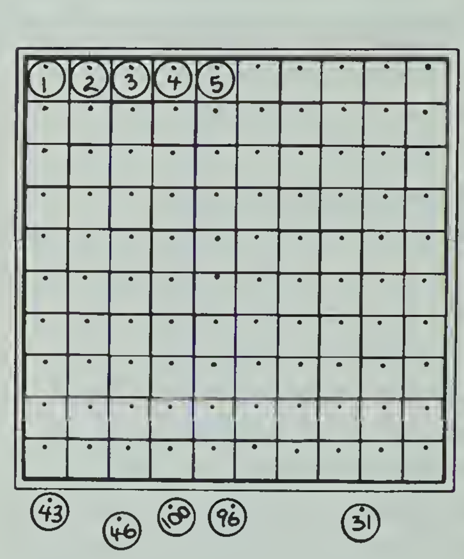


- ***Blank playing cards***
  These can be used to make a variety of cards for use throughout the program. Some examples are illustrated below.

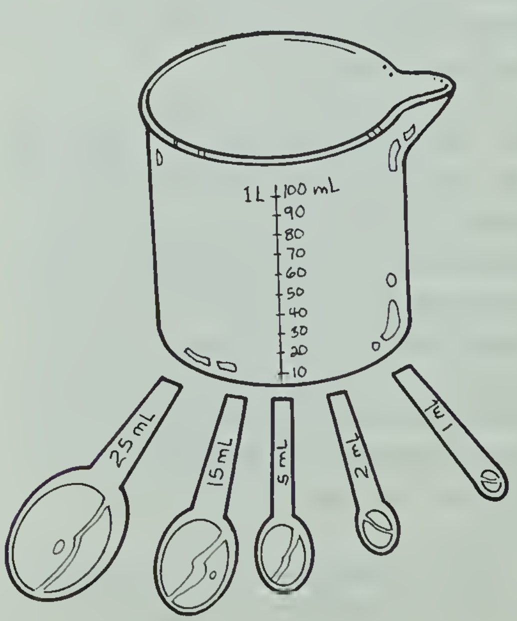
  Concentration cards


15÷5
5
8+4
12
16−3
13
6x3
18

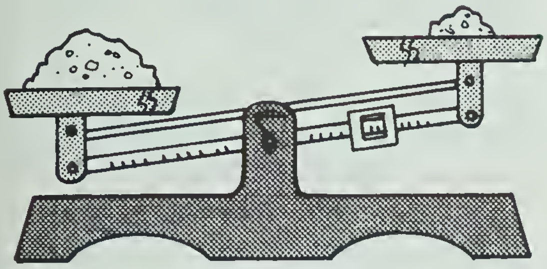
- ***100 board and numeral discs***
  A wall board is an essential piece of equipment for a primary classroom. If you don't have one, you can make your own. The benefits will certainly compensate for the effort expended.
  1. Get a piece of lightweight plywood, 54 cm by 54 cm. Draw a 2 cm margin around the outside edge, and then draw 10 rows and 10 columns of 5 cm by 5 cm squares.
  2. Drive a small nail in the top centre of each square.
  3. Obtain cardboard key tags and write the numerals 1 to 100 on them.


1
2
3
4
5
43
46
100
96
31

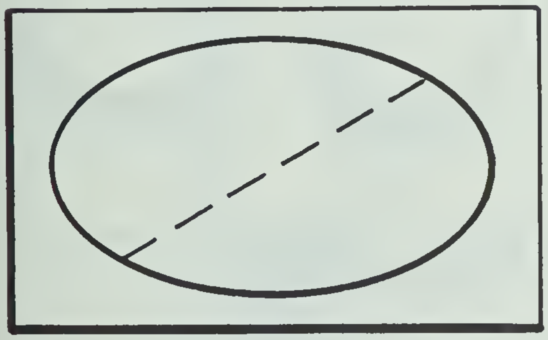
- ***Capacity materials:*** 1 mL, 2 mL, 5 mL, 15 mL, and 25 mL spoons; 1 L container calibrated in millilitres.


1L
100 mL
90
80
70
60
50
40
30
20
10
25 mL
15 mL
5 mL
2 mL
1 mL

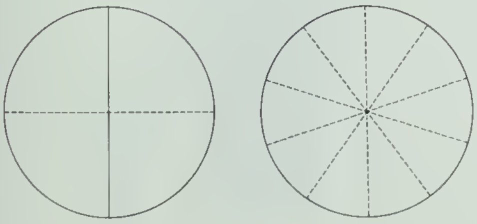
- ***Clocks***
- ***Counters:*** e.g., commercial counters or buttons, chestnuts, acorns, smooth pebbles, bottle caps, etc.
- ***Easel***
- ***Equal arm balances***



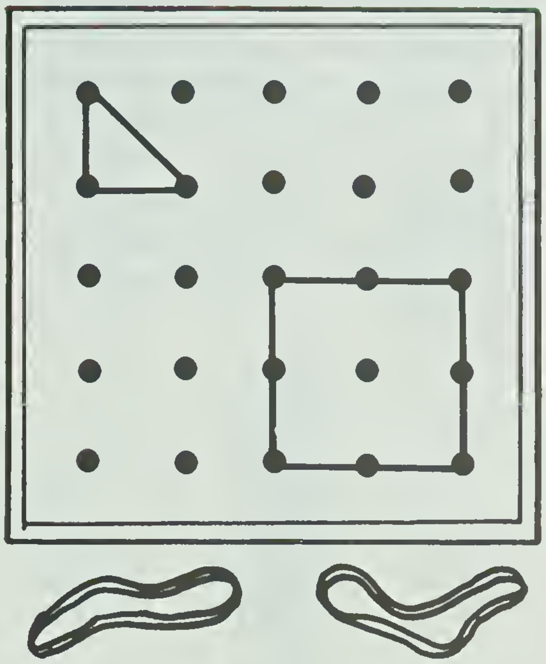
- ***Fact Finders*** (These can be reproduced from Program Master 15.)
  To make more durable fact finders, glue them on to a piece of cardboard and laminate them. A child can use a fact finder to discover addition facts and, once the relationship between addition and subtraction is understood, whole fact families emerge with one placement of a set of counters.



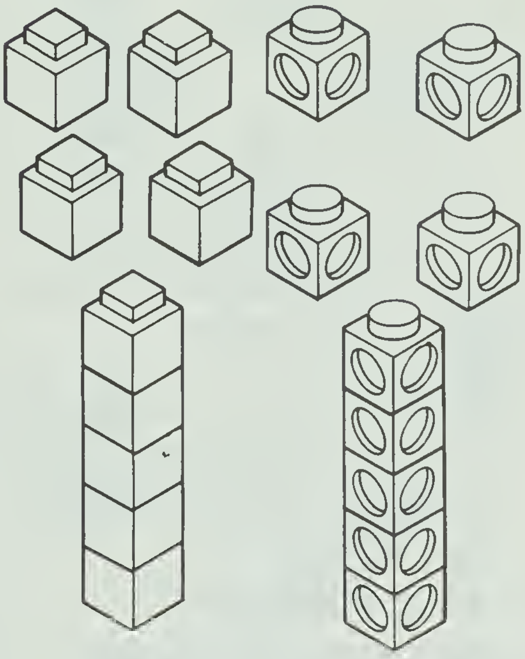
- ***Fractional Pies*** (These can be reproduced from Program Masters 32 and 33.)



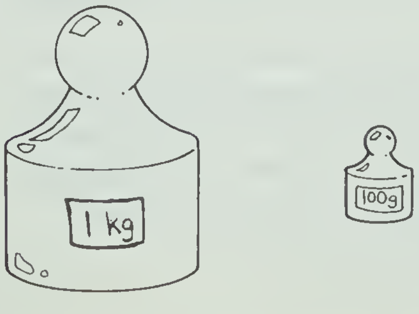
- ***Geoboards***



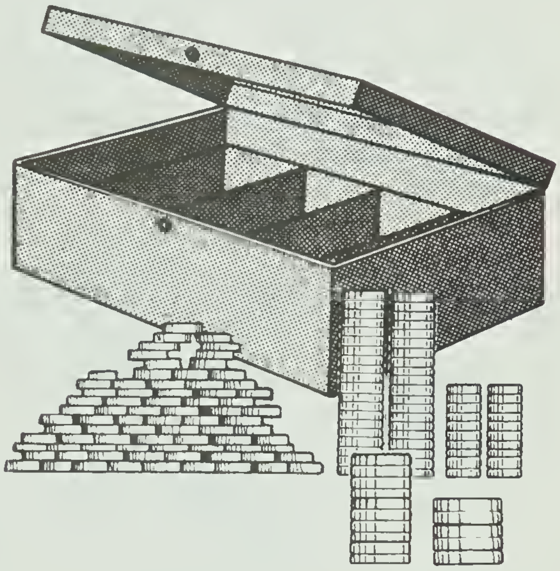
- ***Interlocking cubes***



- ***Logic or attribute blocks***
- ***Masses:*** 1 kg, 1 g, 10 g, 50 g, 100 g, 200 g, 500 g



- ***Money box***
  Using real coins is very helpful in teaching children about money. In some schools, a money box is kept in the office. In it is kept a quantity of coins sufficient for working with a group of eight children. The following quantities are suggested.
  100 pennies
  40 nickels
  20 dimes
  10 quarters
  5 fifty-cent pieces
  For $10.00, the school has thus created a very valuable teaching aid which can be shared among all the classes.

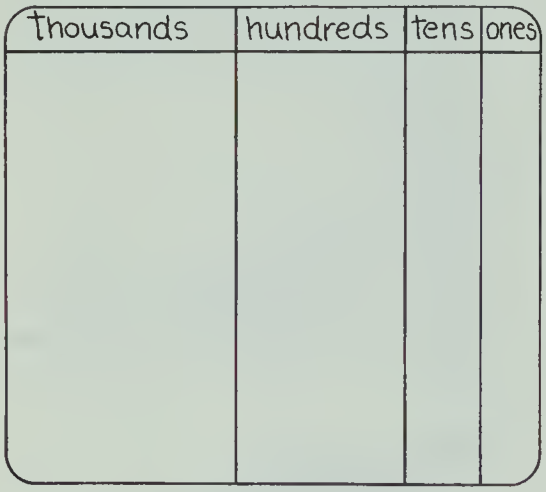


Alternatively, play coins can be created by reproducing Program Masters 8 to 14, gluing them back to back on a thin sheet of card, and cutting out the coins. Each coin will then have a front and a back.

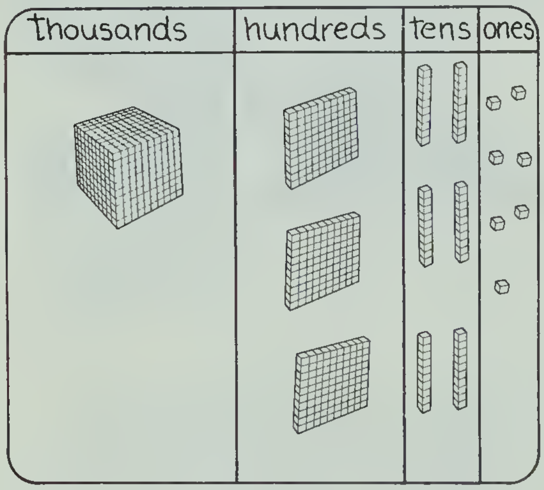
- ***Play money*** (This can be reproduced from Program Masters 8 to 14.)

5 CENTS
CANADA
1978
CANADA
25 CENTS
1980
1 CENT
1970
CANADA
CANADA
10 CENTS
CANADA
1968
50 CENTS
ONE
DEUX
CINQ

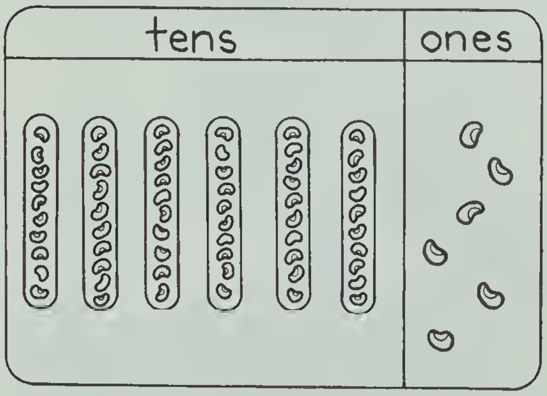
- ***Place-value materials***
  In *mathways 3,* pictured place-value materials include bean sticks and commercial base 10 materials. These should be used on a place-value mat.



If commercial place-value materials are not available, Program Masters 19 and 20 can be used.

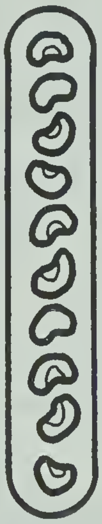


Bean sticks also make excellent base 10 materials.



To make these, you will need 1 kg of dried kidney beans, some tongue depressors and a bottle of white liquid glue. Make a bean stick like this.

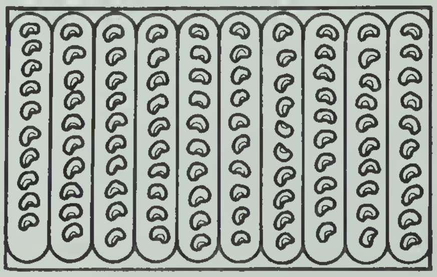
1. Count out 10 beans.
2. Squeeze a bead of glue along a tongue depressor and position the 10 beans along the depressor in the glue.



3. Squeeze a second bead over the beans. This second bead of glue seals the beans firmly onto the stick. At first it may appear untidy, but when the glue dries it becomes invisible. This bean stick is an excellent physical representation of 10.

Make a bean "flat" to represent 100.

1. Cut a piece of corrugated cardboard the length of one bean stick and the width of 10 bean sticks.
2. Glue on 10 bean sticks.



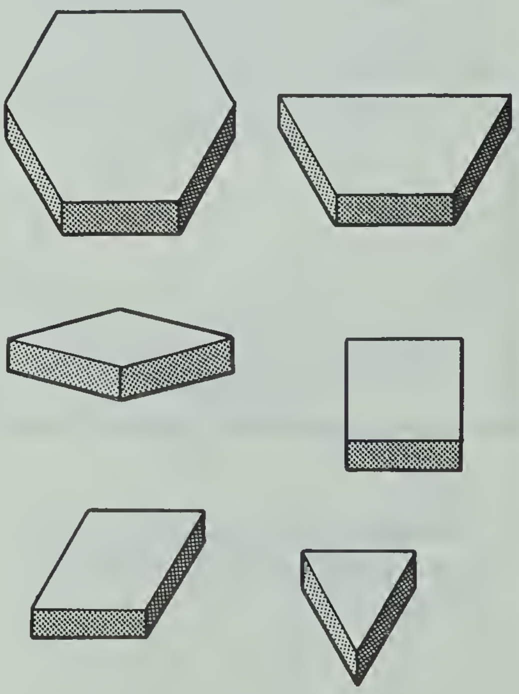
Children can use these flats, sticks and single beans on their place-value mats just as they would use base 10 material. The following quantities are recommended.

sticks — 40 or 50
flats — 19

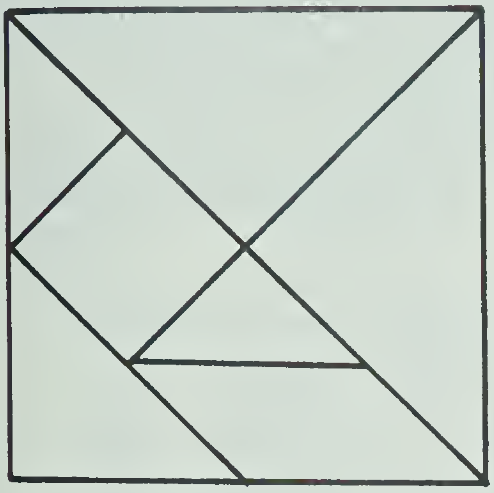
If you like the idea of bean sticks, your more capable students can do the job for you. If you enlist their aid in the project, demonstrate the making of one bean stick. Getting the right quantity of glue on the tongue depressor and in the bead that seals the beans is the most difficult part of the task.

If your students enjoy making the sticks and flats, you might want to increase the quantity so that when you are working in a small group situation, each member can have access to a set. Occasionally you should do a bean stick check. Have students count the beans on each stick to ensure that there are still 10 on each stick. Collect those that need repairing and assign a child to do the job. Repairs are not needed frequently. You will be amazed at how sturdy the material is.

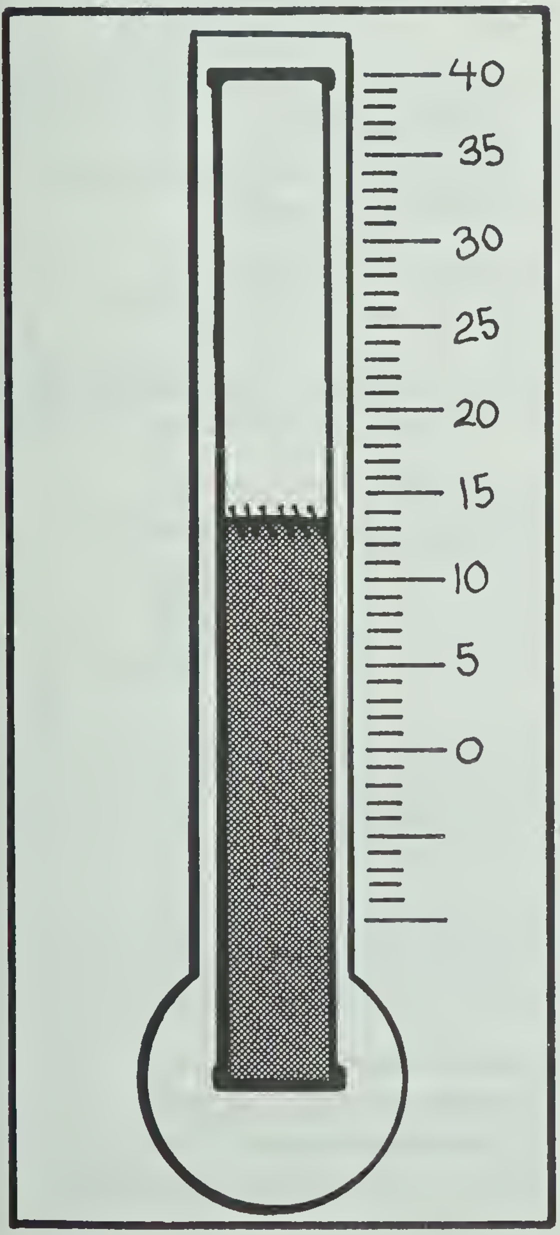
- ***Pattern blocks***



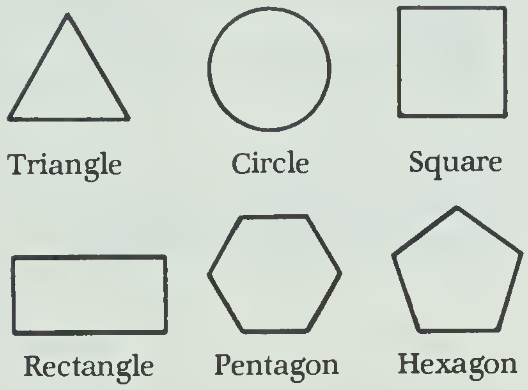
- ***Tangrams*** (These can be reproduced from Program Master 29.)



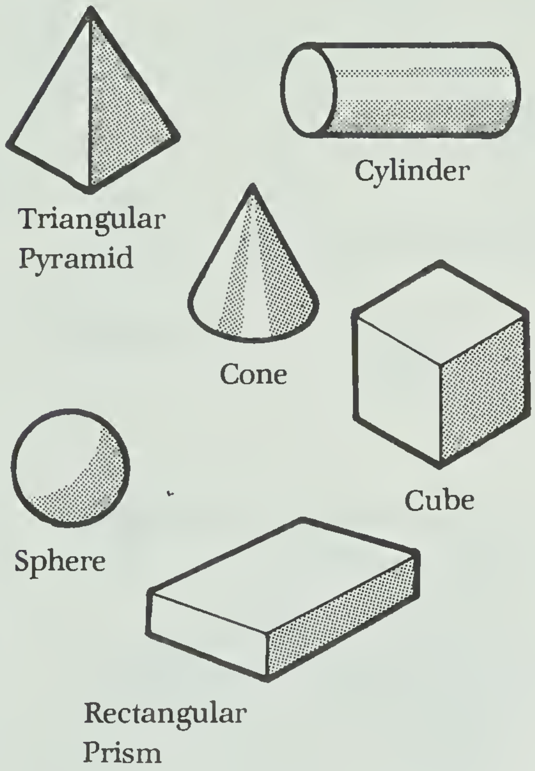
- ***Demonstration thermometer*** To make a demonstration thermometer, stitch two pieces of ribbon, one red and one white, together and loop them through the slots in a model that looks like this: You can pull the ribbon upward or downward to show different temperatures.


40
35
30
25
20
15
10
5
0

- ***Room thermometer***
- ***Two-dimensional geometric models***


Triangle
Circle
Square
Rectangle
Pentagon
Hexagon

- ***Three-dimensional geometric models***


Triangular Pyramid
Cylinder
Cone
Cube
Sphere
Rectangular Prism

Evaluation

Regular evaluation – to note the achievements and difficulties of students – is most important. It enables the teacher to plan. In other words, evaluation helps the teacher to meet students' needs.

Continuous evaluation is the best kind of evaluation.

There are many ways to evaluate. Some of these are:

- Observation of a student doing daily independent work
- Observation of a student in group situations
- Interviews
- Collection of a student's work
- Noting contributions to discussions
- Oral reviews
- Teacher-made tests
- Tests from *mathways 3 Tests* (see supplementary package)

By using these techniques – and others – the teacher will develop a good understanding of each student's proficiencies and deficiencies in mathematics. The program can then be geared to these strengths and weaknesses.

Sample Observation of Daily Independent Work

Observe:

- The student's ability to work independently
- The length of the student's attention span
- Her/his apparent interest in the assignment
- The student's ability to follow directions – oral or written
- The student's behaviour when encountering some difficulty
- The student's behaviour when recognizing that he/she has made an error
- The distractability of the student

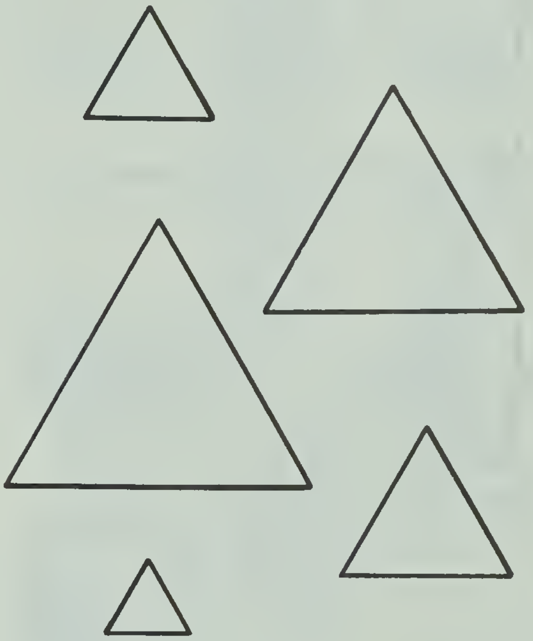
Sample Observation of Student in Group Situation

Observe the student's:

- Ability to share ideas
- Ability to share equipment
- Willingness to wait her/his turn
- Contribution to the task with respect to quality
- Attention to the task at hand
- Attention span

Sample Interview

Materials: set of five cardboard equilateral triangles of varying size



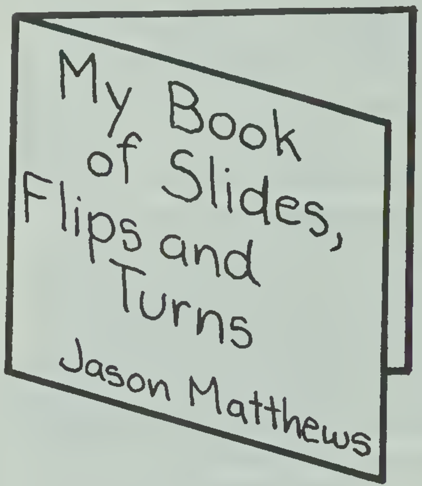
Discussion points might include:

- Names of figures
- Comparison of sizes
- Ordering according to size
- Objects with the same shapes
- Characteristics of figures: sides, vertices

Sample Collection of Student's Work

The samples might be kept in a file folder. Such a file folder might contain:

- Sample pages from student's notebook
- Student-made booklets on specific topics (e.g., My Book of Slides, Flips, and Turns)


My Book of Slides, Flips and Turns
Jason Matthews

- Problems created by the students in group situations
- List of items contributed to math centre by the student

Noting Contributions to Discussion

Observe both the quality and quantity of the student's contributions.

Sample Oral Reviews

Examples of numerical questions

1+7, 9−0, 8+7, 3−3, 2+8, 3−1, 5−1, 6−3, 9−4, 14−7, 1×4, 2×3, 5×2, 5×4, 3×6, 6÷2, 8÷4, 35÷7, 4÷4, 14÷2

Examples of story problems

32 children
4 on each team
How many teams?

Examples of direct questions

"How many vertices has a square?"
"How many minutes in an hour?"

Sample Test

The following page contains a facsimile of a test from the *mathways 3* Tests, available in the Supplementary Package.

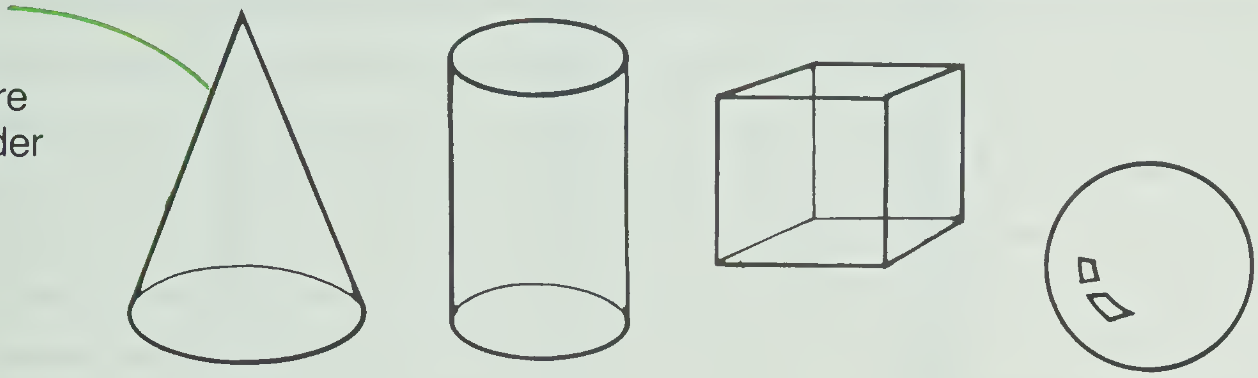
Unit 1 / Test 2A

NAME **SCORE**

Marks

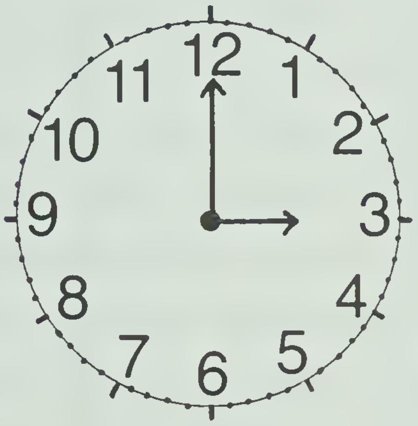
1. Draw a line from the model to the correct name. The first one is done for you.

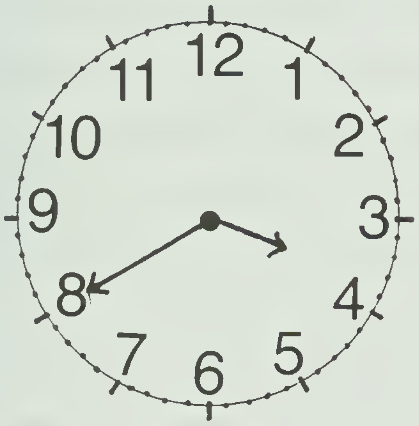
cone
cube
sphere
cylinder



1
1
1

2.





The clock shows ____________. The clock shows ____________. 2.2

3. Add

a) 15
1
3

b) 6
3
11

c) 6
5
8

1,1,1

Evaluation Sheets

It is, of course, most important to keep a careful record of each child's progress. Such a record enables the teacher to answer specific questions about each student's progress and to prepare meaningful anecdotal reports. Checklists indicating growth in both the cognitive and affective domains can be most useful. The following evaluation sheets are realistic in detail and will provide a good, summative picture of students' continuous progress.

A teacher may wish to write brief comments for each entry, or may decide to use ratings. The ratings 1 and 2 could arbitrarily mean:

1 – demonstrates understanding
2 – needs additional experiences.

The evaluation sheets may be reproduced. Cut away the extra paper along the dotted line.

Students' names appear in both the extreme left and extreme right columns. This set-up enables the teacher to check and enter comments easily. The progress of the whole class in any area is visible at one time. Some teachers may prefer to design their own evaluation sheets. Also, the *mathways 3* Tests included in the Supplementary Package contain Record Sheets on which the test results can be recorded.

Evaluation Sheets

Student Name	Numbers to 100	Counting by twos, threes, fours, fives	Time: the hour, five-minute intervals

Evaluation Sheets

Addition and subtraction facts to 18	Multiplication to 5 × 5	Division to 25 ÷ 5

Evaluation Sheets

Length: metres, centimetres	Money: values to one dollar	Bar graphs

Evaluation Sheets

Fractions: $\frac{1}{2}, \frac{1}{4}, \frac{1}{10}$	Capacity: litres	Three-dimensional models

Evaluation Sheets

Place value: three-digit numbers	Adding a two-digit and a one-digit number with regrouping	Subtracting a one-digit number from a two-digit number with regrouping

Evaluation Sheets

Adding 2 two-digit numbers with regrouping	Subtracting a two-digit number from a two-digit number with regrouping	Two-dimensional regions

Evaluation Sheets

Symmetry	Perimeter	Decimals: 0.1 to 9.9

Evaluation Sheets

Decimals: adding and subtracting	Mass: kilograms, grams	Multiplying to 7 × 7

Evaluation Sheets

Dividing to 49 ÷ 7	Time: one-minute intervals	Multiplying to 9 × 9

Evaluation Sheets

Dividing to 81 ÷ 9	Reading charts	Area: counting square centimetres

Evaluation Sheets

Temperature: degrees Celsius	Adding 2 two-digit numbers with regrouping	Subtracting a two-digit number from a two-digit number with regrouping

Evaluation Sheets

Adding three-digit numbers with regrouping	Subtracting three-digit numbers with regrouping	Reading maps	Student Name

Evaluation Sheets

Drawing pictures to help solve problems	Capacity: millilitres	Volume: cubic centimetres	Student Name

Teaching Notes
Unit 2

Scope and Sequence

Index

Teaching Notes
Unit 1

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Title	Scope and Sequence Page
mathways 3 Unit 1	1
mathways 3 Unit 2	2
mathways 3 Unit 3	5
mathways 3 Unit 4	7

Unit 1

Scope and Sequence

Section	Number	Geometry	Measurement	Graphing	Problem Solving
Section 1 Pages **10-19** (TN **6-15**)	Addition and subtraction facts from six to 10				
Section 2 Pages **20-29** (TN **16-27**)	Grouping by tens Tens and ones Sequencing numbers to 100: one greater, one less Addition and subtraction facts of 11 to 14 Counting by twos, threes, fours, fives		*Money* Tens and ones		Byway: *Guess the number;* solving problems involving digits
Section 3 Pages **30-35** (TN **28-34**)			*Time* The hour, five-minute intervals, earlier and later, making clocks		Word problems involving time
Section 4 Pages **36-42** (TN **35-44**)	Addition and subtraction facts of 15 to 18 Regrouping tens and ones		*Time* Five-minute intervals	Concrete graphs Pictographs	
Section 5 Pages **43-49** (TN **45-51**)	Multiplication: to sets of three, repeated addition to 5 × 3				Word problems involving sets of two
Section 6 Pages **50-55** (TN **52-57**)	Multiplication: sets of four to 5 × 4, sets of five to 5 × 5, sets of one to 5 × 1				Word problems involving multiplication
Section 7 Pages **56-64** (TN **58-66**)	Division: equal sets, sets of two to 10 ÷ 2, sets of three to 18 ÷ 3, sets of four to 20 ÷ 4, sets of five to 25 ÷ 5, sets of one to 5 ÷ 1 Multiplying and dividing by one, two, three, four and five				Word problems involving division

Section	**Number**	**Geometry**	**Measurement**		**Problem Solving**
Section 8 Pages **65-73** (TN **67-75**)			*Metre* Estimating and measuring length, greater than, less than *Centimetre* Estimating and measuring *Money* Values up to one dollar, making purchases		Choosing the correct coins Byway: word problems involving money
Section 9 Pages **74-80** (TN **76-82**)				Bar graphs	Word problems involving addition and subtraction Sorting: discovering sorting rules Word problems involving time and money
Checks and Practices Pages **81-88** (TN **83, 84**)					
Unit 2		**Scope and Sequence**			
Section 1 Pages **90-95** (TN **92-97**)	Fractions: one-half, one-quarter, one-tenth Exploring fractions: relating $\frac{1}{10}$ to 0.1		*Capacity* The litre, greater than 1 L, less than 1 L, greater than 5 L, less than 5 L		
Section 2 Pages **96-103** (TN **98-107**)	Recalling fractions, decimals	Exploring the properties of cones, cylinders, rectangular prisms, cubes, spheres Art ideas	Recalling centimetres, money		Word problems
Section 3 Pages **104-109** (TN **108-113**)	Recalling addition and subtraction facts using number pairs Extensions: number charts Extending basic facts to find sums and differences				

	Number	**Geometry**	**Measurement**	**Graphing**	**Problem Solving**
Section 4 Pages **110-119** (TN **114-126**)	Place value: hundreds, tens, ones; expanded numerals Ordering numbers: counting forward, backward, before, after, between Number patterns: counting by ones, twos, fours, fives Greater than, less than Ordering three-digit numbers: least to greatest, greatest to least				Byway: logical thinking
Section 5 Pages **120-124** (TN **127-133**)	Adding a two-digit and a one-digit number: no exchange, exchanging ones for tens				
Section 6 Pages **125-130** (TN **134-140**)	Subtracting a one-digit number from a two-digit number: no regrouping, regrouping tens and ones				
Section 7 Pages **131-138** (TN **141-151**)	Adding two-digit numbers: regrouping Subtracting a two-digit number from a two-digit number: regrouping Recalling place value, number patterns, counting, comparing numbers, adding, subtracting				Byway: finding missing numbers in addition and subtraction questions Drawing pictures of problems

	Number	**Geometry**	**Measurement**	**Graphing**	**Problem Solving**
Section 8 Pages **140-149** (TN **152-161**)		Polygons: squares, triangles, rectangles, hexagons, circles, properties			Word problems involving adding and subtracting amounts of money
Section 9 Pages **150-154** (TN **162-167**)		Symmetry: making symmetrical figures Byway: sliding and tracing figures to create designs			
Section 10 Pages **155-160** (TN **168-173**)			*Exploring perimeter* Measuring, counting, adding with centimetres, using centimetre rulers *Byway* Finding the perimeter of a circle		Word problems involving perimeter
Section 11 Pages **161-170** (TN **174-187**)	Decimals: 0.1 to 0.9, whole numbers and decimals to 9.9, matching decimals to points on a number line, adding, subtracting Greater than, less than: decimals less than 1.0 Byway: adding decimal tenths to make one	Recalling geometric figures			Word problems involving decimals
Section 12 Pages 171-174 (TN **188-191**)			*Mass* Estimating, measuring, comparing, kilograms, 1 kg, grams, 100 g, 10 g, 1 g		
Checks and Practices Pages **175-182** (TN **192, 193**)					

Unit 3

Scope and Sequence

	Number	Geometry	Measurement	Graphing	Problem Solving
Section 1 Pages **184-189** (TN **201-206**)	Multiplying: sets of six to 6 × 7, sets of 7 to 7 × 7 Dividing by six to 42 ÷ 6, by seven to 49 ÷ 7				
Section 2 Pages **190-199** (TN **207-219**)	Equivalent multiplication sentence: using rows and columns Multiplication: facts to 7 × 7, drawing pictures Division: using rows and columns, drawing pictures to 49 × 7		*Time* One-minute intervals, earlier, later, problem solving		Solving problems about time
Section 3 Pages **200-205** (TN **220-228**)	Multiplying by eight to 8 × 9, by nine to 9 × 9 Dividing by eight, nine Making arrays, mental arithmetic				Reading charts, solving word problems
Section 4 Pages **206-211** (TN **229-234**)	Recalling multiplication and division facts	Area: counting squares and square centimetres, creating designs	*Temperature* Reading and comparing temperatures above 0°C, graphing temperature	Graphing temperature	
Section 5 Pages **212-219** (TN **235-245**)	Place value and expanded numerals for three-digit numbers Three-digit numbers on an abacus Adding two-digit numbers: exchange 10 ones for a ten Using expanded numerals to make an exchange Subtraction requiring regrouping on the abacus Using expanded numerals for subtraction requiring an exchange				Solving word problems, reading and making maps

	Number	Geometry	Measurement	Graphing	Problem Solving
Section 6 Pages **220-224** (TN **246-255**)	Using standard and expanded numerals to add three-digit numbers Exchanging 10 ones for 1 ten Adding three-digit numbers: exchanging 10 tens for 1 hundred, making two exchanges, thinking the exchange				
Section 7 Pages **225-233** (TN **256-267**)	Subtracting three-digit numbers: exchanging 1 ten for 10 ones, 1 hundred for 10 tens, two exchanges Thinking the exchanges for adding and subtracting Recalling addition and subtraction for two- and three-digit numbers				Making and using maps, making up and solving problems Drawing pictures to help solve problems
Section 8 Pages **234-241** (TN **268-275**)	Recalling multiplication and division facts: products and dividends on a diagonal, number pairs, solving problems				Solving multiplication problems
Section 9 Pages **242-245** (TN **276-279**)			*Capacity* Estimating and measuring the millilitre, 100 mL		
Section 10 Pages **246-250** (TN **280-284**)		Tangram: exploring, making rectangles, squares, triangles			
Section 11 Pages **251-256** (TN **285-291**)		Volume: building with cubes, counting cubic centimetres, kilometre			

	Number	Geometry	Measurement	Graphing	Problem Solving
Section 12 Pages **257-264** (TN **292-302**)	Decimals: adding sums greater than one, exchanging 10 tenths for one, thinking the exchange Decimals: subtracting, exchanging 10 tenths for one, exchanging one whole for 10 tenths, thinking the exchange				
Section 13 Pages **265-271** (TN **303-309**)	Multiplication and division: solving word problems		Kilometres: solving word problems *Money* Solving word problems		Solving word problems Drawing pictures to help solve word problems Solving word problems with multiplication and division, maps, distance in kilometres, amounts of money
Checks and Practices Pages **272-279** (TN **310-312**)					
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Section 1 Pages **281-285** (TN **316-321**)	Thousands: writing numbers to 9000, the place-value meaning of four-digit numbers to 9999				
Section 2 Pages **286-292** (TN **322-330**)	Four-digit numbers: writing the meaning, the expanded numerals and the standard numeral, using an abacus, before, after, between, ordering greatest to least, least to greatest Completing number patterns		*Calendar* Writing the year		

	Number	Geometry	Measurement	Graphing	Problem Solving
Section 3 Pages **293-299** (TN **331-337**)	Decimals: hundredths, relating to centimetres and metres		*Length* Relating centimetres and metres to decimals *Millimetre* Solving word problems		Solving word problems: millimetres
Section 4 Pages **300-305** (TN **338-345**)		Exploring slides and flips	*Money* Making change		Solving word problems: adding and subtracting amounts of money
Section 5 Pages **306-313** (TN **346-357**)	Multiplying by 10 and multiples of 10 Multiplying a two-digit number by a one-digit number, expanded numerals		*Length* Converting centimetres to millimetres and metres to centimetres *Money* Converting dollars to cents		
Section 6 Pages **314-321** (TN **358-368**)	Division: facts to 81 ÷ 9		*Time* Using a calendar, writing dates		Word problems involving division Solving word problems involving the calendar
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Teaching Notes
Unit 2

Teaching Notes
Unit 3

Unit 4

Teaching Notes
Unit 1

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See the *Unit at a Glance* for a detailed description of the objectives in each section.

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Unit 1 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 1					• large beans • newspapers • spray paint • counters • beads • numeral cards 0 to 9 • gameboard for *Snakes and Ladders* • die • *Concentration* cards, TN page 14 • number line • stencils, TN page 15 • Program Masters 15, 21	set counter add/addition subtract/subtraction zero plus equals group story problem word problem fact more fewer addition sentence sum order fact family Fact Finder subtraction sentence addition chart difference array
1	**10, 11**	**6, 7**	Addition facts to six	Plus Workbook page 1		
2	**12**	**8**	Subtraction facts to six			
3	**13**	**9**	Subtraction facts to six	Plus Workbook page 2		
4	**14**	**10**	Addition and subtraction facts to six	Practice Masters page 1		
5	**15**	**11**	Addition and subtraction facts to seven			
6	**16**	**12**	Addition and subtraction facts to eight			
7	**17**	**13**	Facts to eight; three addends			
8	**18, 19**	**14, 15**	Addition and subtraction facts of nine and 10	Practice Masters page 2 Plus Workbook page 3		

Unit 1 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 2					• bean sticks • place-value material • place-value cards for two-digit numbers, TN page 18 • One Hundred Board and numeral discs • pennies • dimes • old toys • box • coloured numeral cards, TN page 19 • newspapers, catalogues • beans • counters • numeral cards 0 to 14 • stencil, TN page 27 • Program Masters 8-16, 11, 21, 15, 22	tens ones place-value mat 10-strip unit strip coin penny dime value cent price One Hundred Board before after missing number pattern greater than less than digit puzzle twos threes fours fives number line
1	**20, 21**	**16, 17**	Grouping by tens	Plus Workbook page 4		
2	**22**	**18**	Tens and ones			
3	**23**	**19**	Tens and ones: money	Practice Masters page 3 Plus Workbook page 5		
4	**24, 25**	**20, 21**	Sequencing numbers to 100: one greater, one less	Practice Masters page 4 Plus Workbook page 6		
5	**26**	**22**	Byway: *Guess the number*; solving problems involving digits			
6	**27**	**23**	Addition and subtraction facts of 11 and 12			
7	**28**	**24, 25**	Exploring facts of 13 and 14	Tests 1A, 1B Plus Workbook page 7		
8	**29**	**26, 27**	Counting by twos, threes, fours and fives	Practice Masters page 5 Plus Workbook page 8		
Section 3					• model clock • various kinds of clocks • magazines • model clock face • old clock or cardboard model • plywood • compass • paper plates • wing clip • tin cans • Program Master 25	time hour hand minute hand o'clock earlier later sundial water timer
1	**30**	**28**	Telling time: the hour			
2	**31**	**29**	Telling time: five-minute intervals			
3	**32**	**30**	Writing hour plus five-minute intervals			
4	**33**	**31**	Time: earlier and later			
5	**34**	**32**	Solving problems involving time	Plus Workbook pages 9 and 10		
6	**35**	**33, 34**	Byway: making clocks	Practice Masters page 6		

Unit 1 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 4					• counters • Fact Finder • display-size addition chart, TN page 36 • number line • *Concentration* cards, TN page 37 • display-size nomograph, TN page 39 • old playing cards • interlocking cubes • month cards • easel-size birthday graph, TN page 41 • colour name cards • colour chart • Program Masters 23, 21, 26, 6	even odd row column cube graph pictograph
1	**36**	**35**	Addition and subtraction facts of 15 and 16	Practice Masters page 7		
2	**37**	**36, 37**	Addition and subtraction facts of 17 and 18	Practice Masters pages 8, 60 and 61 Plus Workbook pages 11, 12, 93 and 94		
3	**38, 39**	**38, 39**	Recalling facts to 18, five-minute intervals, regrouping tens and ones; byway: recalling fact families			
4	**40**	**40, 41**	Concrete graphs			
5	**41**	**42, 43**	Pictographs			
6	**42**	**44**	Pictographs	Tests 2A, 2B Plus Workbook page 13		
Section 5						
1	**43, 44**	**45, 46**	Multiplication: sets of two		• counters • paper plates • slices of bread • cards for illustrating sets of three, TN page 49 • multiplication expression cards, TN page 49 • die marked 0, 1, 2, 3, 4 and 5 • die marked 2, 2, 2, 3, 3 and 3	times multiply/multiplication diagonal product
2	**45**	**47**	Solving word problems: sets of two			
3	**46, 47**	**48, 49**	Multiplication: sets of three			
4	**48**	**50**	Multiplication and repeated addition to 5 × 2			
5	**49**	**51**	Multiplication and repeated addition to 5 × 3	Plus Workbook page 14		

Unit 1 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 6					• One Hundred Board • counters • paper plates • multiplication chart, TN page 55 • number line • *Concentration* cards, TN page 56 • Program Master 24	
1	**50**	**52**	Multiplication: sets of four to 5 × 4	Practice Masters page 9		
2	**51**	**53**	Multiplication: sets of five to 5 × 5	Plus Workbook page 15		
3	**52, 53**	**54, 55**	Using multiplication to solve word problems			
4	**54**	**56**	Multiplication: repeated addition to 5 × 5			
5	**55**	**57**	Multiplication: sets of one to 5 × 1	Practice Masters page 10		
Section 7						
1	**56**	**58**	Division: equal sets		• counters • number line • catalogues • flash cards, TN page 63 • multiplication-fact cards, TN page 66 • division-fact cards, TN page 66 • Program Master 3	divide/division equal sets
2	**57**	**59**	Division: sets of two to 10 ÷ 2			
3	**58**	**60**	Division: sets of three to 18 ÷ 3	Plus Workbook page 16		
4	**59**	**61**	Division: sets of four to 20 ÷ 4	Practice Masters page 11		
5	**60**	**62**	Division: sets of five to 25 ÷ 5			
6	**61**	**63**	Division: sets of one to 5 ÷ 1			
7	**62**	**64**	Division: sets of two, three, four and five			
8	**63**	**65**	Using division to solve word problems	Practice Masters page 12 Tests 3A, 3B Plus Workbook page 17		
9	**64**	**66**	Multiplying and dividing by one, two, three, four and five			

Unit 1 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 8						
1	**65**	**67**	Estimating lengths: greater than or less than one metre		• metre stick • string • tape measure • ruler marked in centimetres • activity cards, TN page 68 • cardboard strip 1 cm by 21 cm • stencil, TN page 71 • 100 pennies • 20 nickels • 10 dimes • 4 quarters • 2 half-dollars • 1 dollar bill • catalogues • Program Masters 8 – 14	metre metre stick measure/measurement length estimate centimetre distance line segment bar graph one dollar half-dollar quarter amount total
2	**66**	**68**	Estimating and measuring lengths to the nearest metre			
3	**67**	**69**	Estimating lengths greater than or less than 5 cm, 10 cm, 15 cm			
4	**68, 69**	**70, 71**	Estimating and measuring lengths to the nearest centimetre	Practice Master page 13 Plus Workbook page 18		
5	**70, 71**	**72, 73**	Values up to one dollar			
6	**72**	**74**	Money: making purchases	Practice Masters page 14 Plus Workbook page 19		
7	**73**	**75**	Byway: solving word problems involving money			
Section 9						
1	**74**	**76**	Bar graphs		• interlocking cubes • old magazines • picture of zoo animals • graph paper • items for sorting: attribute pieces, pictures of toys or school supplies • box • model clock	operation sort
2	**75**	**77**	Choosing addition or subtraction to solve word problems			
3	**76**	**78**	Choosing addition or subtraction to solve word problems	Plus Workbook page 20		
4	**77**	**79**	Bar graphs			
5	**78**	**80**	Bar graphs	Practice Masters page 15		
6	**79**	**81**	Sorting: discovering sorting rules			
7	**80**	**82**	Solving word problems involving time and money; multiplying and dividing by one to five	Tests 4A, 4B Plus Workbook page 21		
	81-88	**83, 84**	Checks and Practices	Unit 1, Unit Tests A, B		

Unit 1 Section 1 Lesson 1

Recalling Addition Facts: The Meaning of Addition

Materials

- large beans
- newspapers
- spray paint
- for each child
  - counters

Rationale

Section 1 of *mathways 3* reviews the meaning of addition and subtraction facts to 10. Learning number facts begins with activities in which the children manipulate concrete materials. The children's experience with concrete materials is then extended to include semi-concrete, or pictorial, representations of number facts, for example, on a number line or drawings of counters in various groupings. Based on these experiences, the children are able to complete number sentences without the aid of counters, and can commit number facts to memory. Short drills at frequent intervals thereafter help the children to retain the number facts. The games and activities suggested under Written and Other Activities provide enjoyable opportunities to practise number facts and apply them in a meaningful context.

Since little copying of mathematics is required of Grade Two children, Grade Three's may find it difficult to adjust to working from a text. Explaining the instructions and stating expectations for neatness and accuracy will help the children make the necessary adjustment and complete the exercises successfully. Often, providing them with an acceptable model and stating a time limit is beneficial.

Lesson

1

Seat the children around the easel. Give each child six counters.

Make a set of three counters.
Now make a set of two counters.
Put both sets together.
How many counters do you have altogether?
What number sentence would we write to show what we have done?

Write 3+2=5 on the easel. Have each child record the sentence.

Review the meaning of the symbols + and = .

Repeat this activity several times for addition facts to six. Have children take turns writing the number sentences on the easel. Have each child record the sentences on paper. Since basic facts involving zero require special attention, include examples such as 4+0 and 0+3. Encourage the children to talk about these activities. Use the terms *add* and *addition* during the discussion.

2

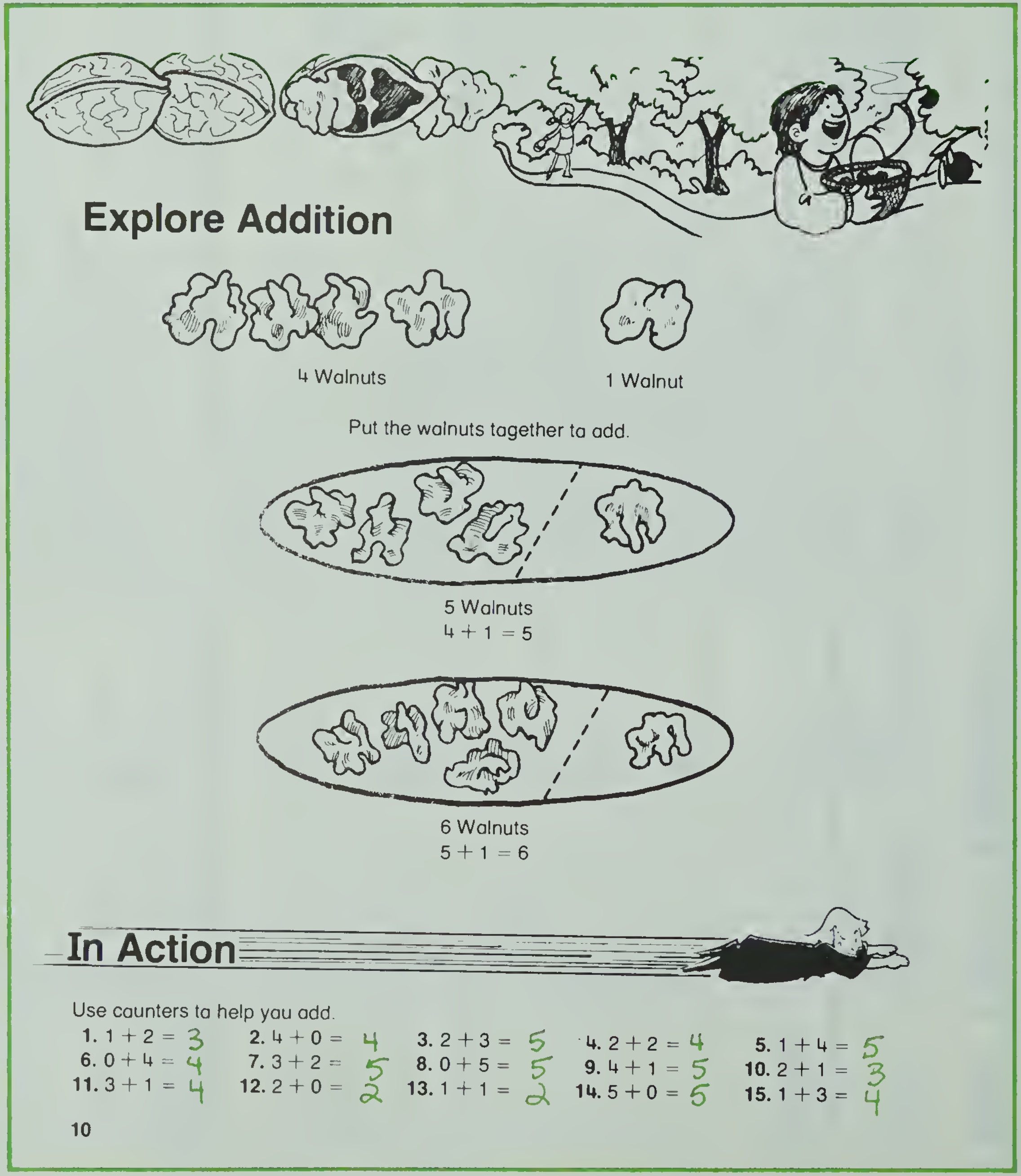
Ask the children to explain the meaning of addition in their own words. Develop the concept that addition means putting groups together, or joining groups.

3

Develop story problems that involve the facts to six. For example, one child groups four pencils or other objects and then adds one more.

Another child writes the number sentence on the easel to show the addition. A third child says a word problem for the addition.

For 4+1=5, the problem could be the following:



Explore Addition

4 Walnuts

1 Walnut

Put the walnuts together to add.

5 Walnuts
4 + 1 = 5

6 Walnuts
5 + 1 = 6

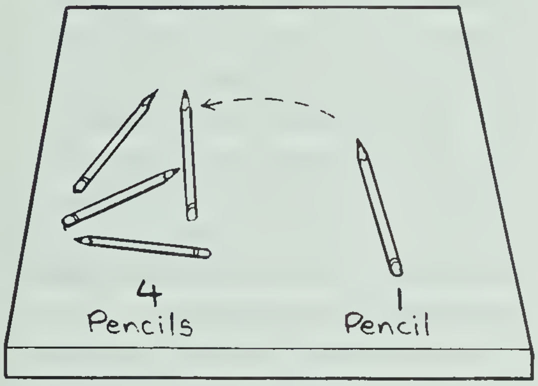
In Action

Use counters to help you add.

1. 1 + 2 = 3
2. 4 + 0 = 4
3. 2 + 3 = 5
4. 2 + 2 = 4
5. 1 + 4 = 5
6. 0 + 4 = 4
7. 3 + 2 = 5
8. 0 + 5 = 5
9. 4 + 1 = 5
10. 2 + 1 = 3
11. 3 + 1 = 4
12. 2 + 0 = 2
13. 1 + 1 = 2
14. 5 + 0 = 5
15. 1 + 3 = 4

10

Four pencils were on the table.
One pencil was added.
How many pencils are there now?



or

Four children were skipping.
Another child joined the group.
How many children were skipping then?

Written and Other Activities

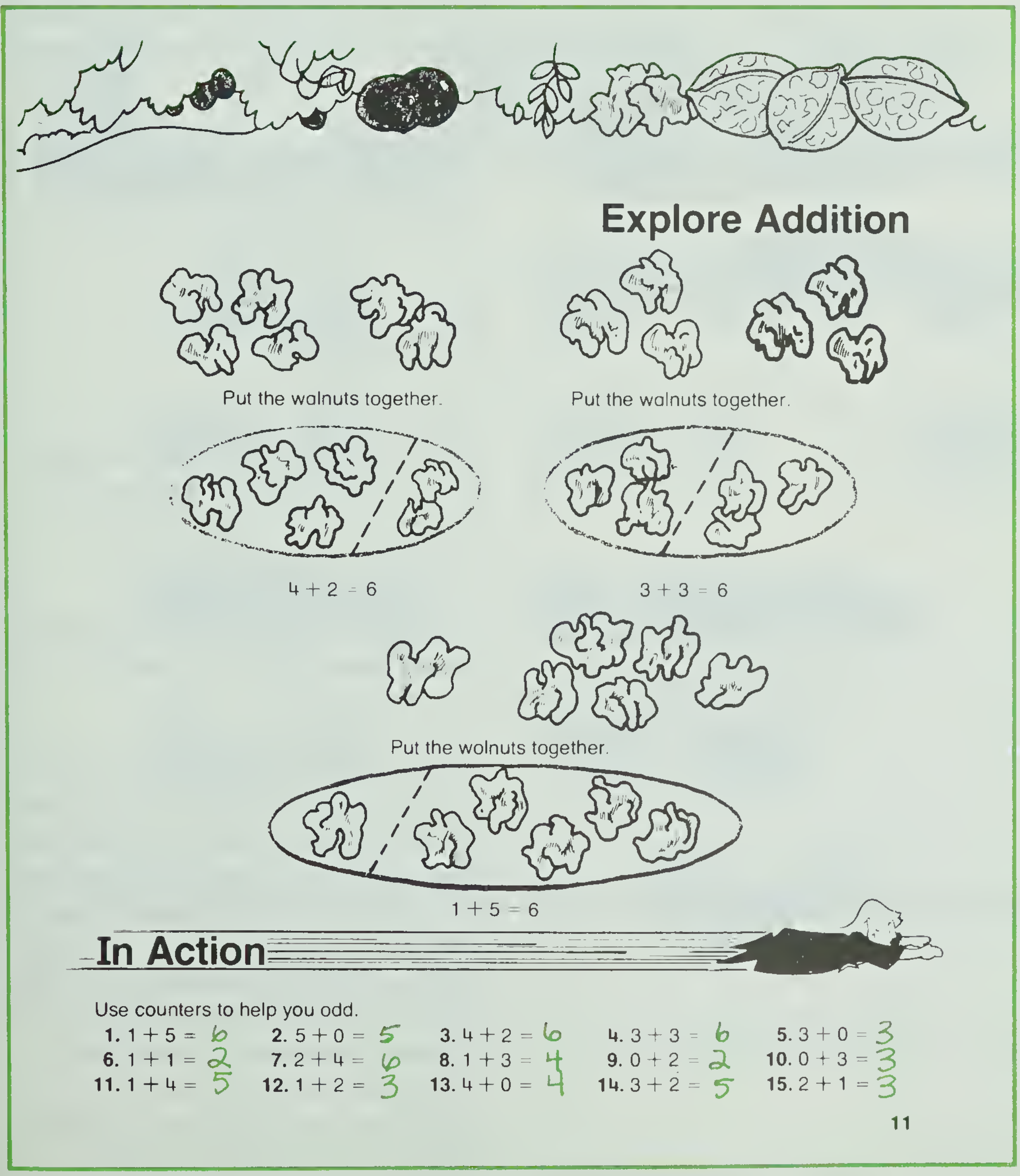
☐

mathways 3, pages 10, 11

Before assigning the In Action exercises, have children read and discuss the examples given in the Explore element on both pages. Then ask several children how they will complete the addition and subtraction questions. When clear instructions have been established, state a time limit and have the children begin.

☐ ☐

Have children draw pictures to show some of the addition questions on pages 10 and 11. For question 1 on page 10, they could draw a set of one walnut and a set of two walnuts and then join the sets.



Explore Addition

Put the walnuts together.

4 + 2 = 6

Put the walnuts together.

3 + 3 = 6

Put the walnuts together.

1 + 5 = 6

In Action

Use counters to help you add.

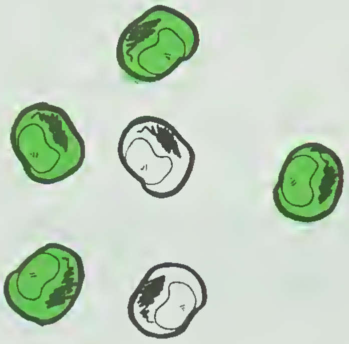
1. 1 + 5 = 6 2. 5 + 0 = 5 3. 4 + 2 = 6 4. 3 + 3 = 6 5. 3 + 0 = 3
6. 1 + 1 = 2 7. 2 + 4 = 6 8. 1 + 3 = 4 9. 0 + 2 = 2 10. 0 + 3 = 3
11. 1 + 4 = 5 12. 1 + 2 = 3 13. 4 + 0 = 4 14. 3 + 2 = 5 15. 2 + 1 = 3

11

☐ ☐ ☐

Obtain about one kilogram of dried beans such as lima beans or fava beans. Spread the beans out on old newspapers and spray paint one side of them.

Toss six beans. Then ask the children to name the number of beans with the unpainted side showing and the number with the painted side showing. Ask what number sentence is suggested.



4 + 2 = 6

This presents an opportunity to point out the commutative property of addition.

Have the children give some sentences orally and write some. Repeat this until most of the facts of six have been reviewed.

0 + 6 = 6
1 + 5 = 6
2 + 4 = 6
3 + 3 = 6
4 + 2 = 6
5 + 1 = 6
6 + 0 = 6

Repeat the procedure, using fewer than six beans to review addition facts to five.

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 1

Unit 1 Section 1 Lesson 2

Recalling Subtraction Facts: The Meaning of Subtraction

Materials

- six large beans, spray painted on one side
- for each child
  - counters

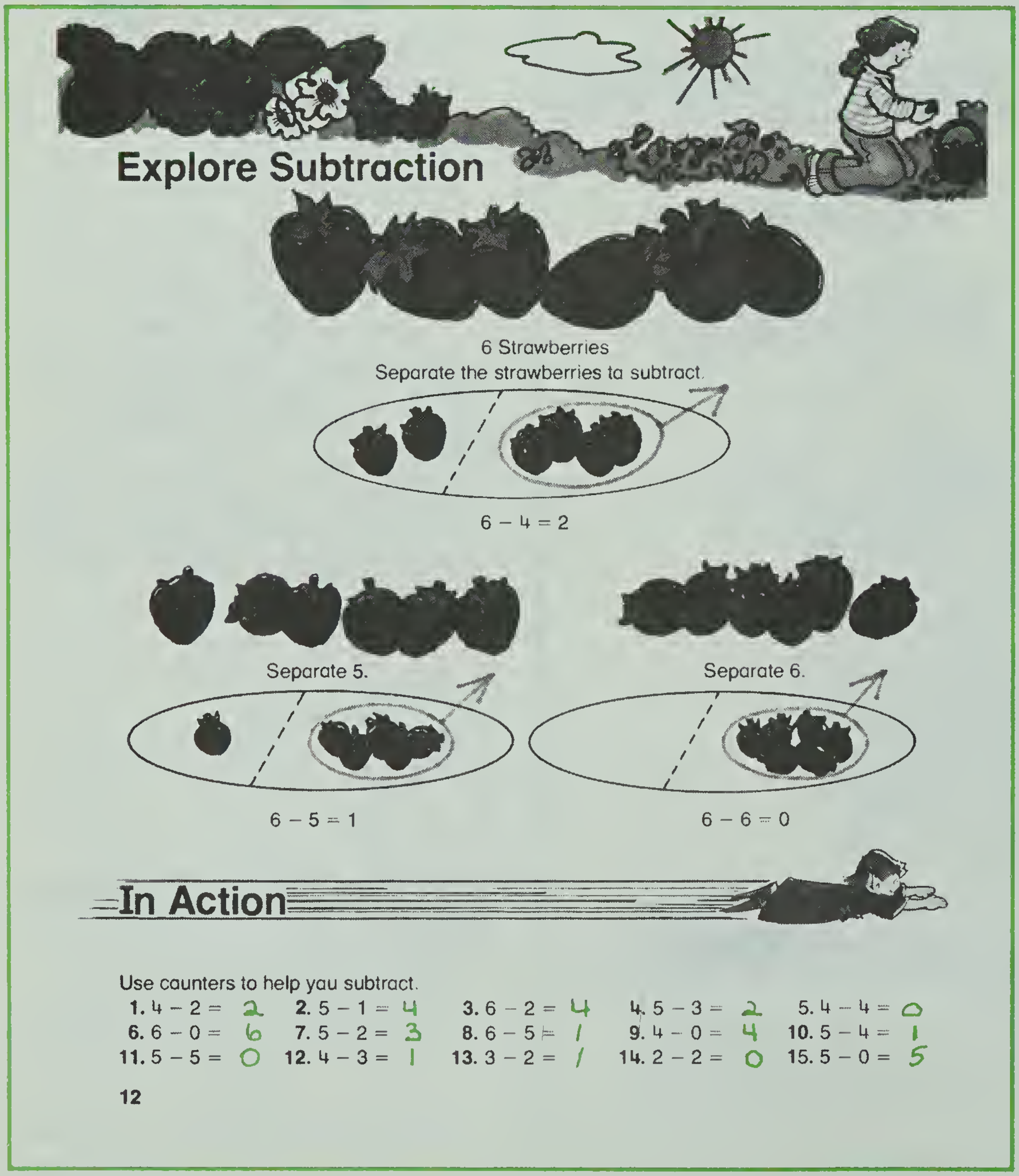
Lesson

1

Seat the children around the working area. Give six counters to each child and give the following instructions:
Make a set of six counters.
Now, take two counters away.
How many counters are left, Vera?
Write a number sentence on the easel to show what we have done, Risa.
Have the child explain the meaning of the symbol for subtraction. Then have all the group members record the sentence on paper. Repeat the procedure to develop the remaining subtraction facts of six, giving each child an opportunity to write a subtraction sentence on the easel. Include questions that have zero as the subtrahend, such as 6−0=6, and difference, such as 6−6=0. Encourage the children to describe each activity, using the terms *subtract* and *subtraction*.

2

Referring to the number sentences written on the easel, ask the children if they can notice anything that is true of each of the first numbers in the sentences. Use the opportunity to point out that the minuend in every case is greater than the subtrahend.



Explore Subtraction

6 Strawberries
Separate the strawberries to subtract.

6 − 4 = 2

Separate 5.

6 − 5 = 1

Separate 6.

6 − 6 = 0

In Action

Use counters to help you subtract.
1. 4 − 2 = 2 **2.** 5 − 1 = 4 **3.** 6 − 2 = 4 **4.** 5 − 3 = 2 **5.** 4 − 4 = 0
6. 6 − 0 = 6 **7.** 5 − 2 = 3 **8.** 6 − 5 = 1 **9.** 4 − 0 = 4 **10.** 5 − 4 = 1
11. 5 − 5 = 0 **12.** 4 − 3 = 1 **13.** 3 − 2 = 1 **14.** 2 − 2 = 0 **15.** 5 − 0 = 5

12

3

Have each child in the group make up and illustrate a story problem that involves subtraction. For example,
I bought six ice cream cones and my brother ate two of them.
How many ice cream cones are left?
The child illustrates each step with counters and writes the number sentence on the easel. The other group members record the sentence on paper and answer the question.

4

Represent a subtraction question pictorially on the easel. For example, draw six apples and loop three of them to show subtraction.

Ask a child to state the question.
There were six apples and three were subtracted. How many apples are left?
Have another child record the number sentence on the easel.
6 − 3 = 3
Have all the group members record it on paper and give the answer.
Repeat several times.

Written and Other Activities

☐

mathways 3, page 12

Discuss each example before assigning the In Action exercise. Have two or three children tell how they will complete the questions.

☐ ☐

Have the children illustrate some of the subtraction questions on page 12.

☐ ☐ ☐

Use beans, such as lima or fava beans, that have been spray painted on one side to develop subtraction questions. Toss six beans. Ask the children to tell how many of the beans have landed with the unpainted and painted sides showing. Have another child write the appropriate subtraction sentence on the easel. Repeat until most of the subtraction facts of six have been discovered. Have children toss fewer beans to review the facts to five.

Unit 1 Section 1 Lesson 3

Recalling Subtraction Facts to Six: Comparing Sets

Materials

- large beans, one side spray painted
- for each child
  - six beads
  - crayons
- for each group
  - two sets of numeral cards, 0 to 6

Lesson

1

Gather the children around the working area. Give each child six beads and instruct the children as follows:

Make a set of three beads and a set of one bead.

Tell me which of the sets has more beads Larrissa.

Tell how many more beads are in the set, Joe.

Write a subtraction sentence on the easel, Clifford, to show how many more beads are in one set than are in the other set.

Repeat several times. Include comparisons that involve an empty set, such as 6 − 0 = 6, and equivalent sets, such as 6 − 6 = 0. In some instances, have the children name the smaller set first. Discuss that the greater number is always written first in a subtraction sentence. Have the children record each sentence that is developed.

2

Vary the instructions as follows:

Make a set of zero beads and a set of two beads.

Ask

Which set has fewer beads?

How many fewer beads does it have?

Have one child write the number sentence on the easel and the other children record it on paper. Repeat.

3

Toss a number of beans. Ask

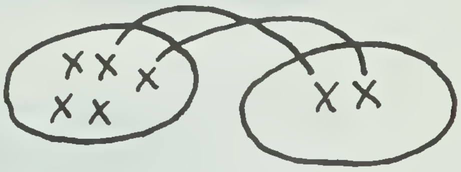
How many fewer coloured beans have landed than uncoloured beans?

What subtraction sentence can we write to show this?

Have a child write the sentence on the easel. Repeat, asking children to identify sets that have more and fewer beans and write the appropriate subtraction sentences.

4

Have each child draw on a sheet of paper two loops, each containing a set of objects. Have the children exchange papers with a neighbour and draw lines to match the objects in one loop with the objects in the other. Have the children pass the papers along so that a third child can write a number sentence to represent the picture. Display the drawings in the classroom.



5 − 2 = 3

Written and Other Activities

☐

mathways 3, page 13

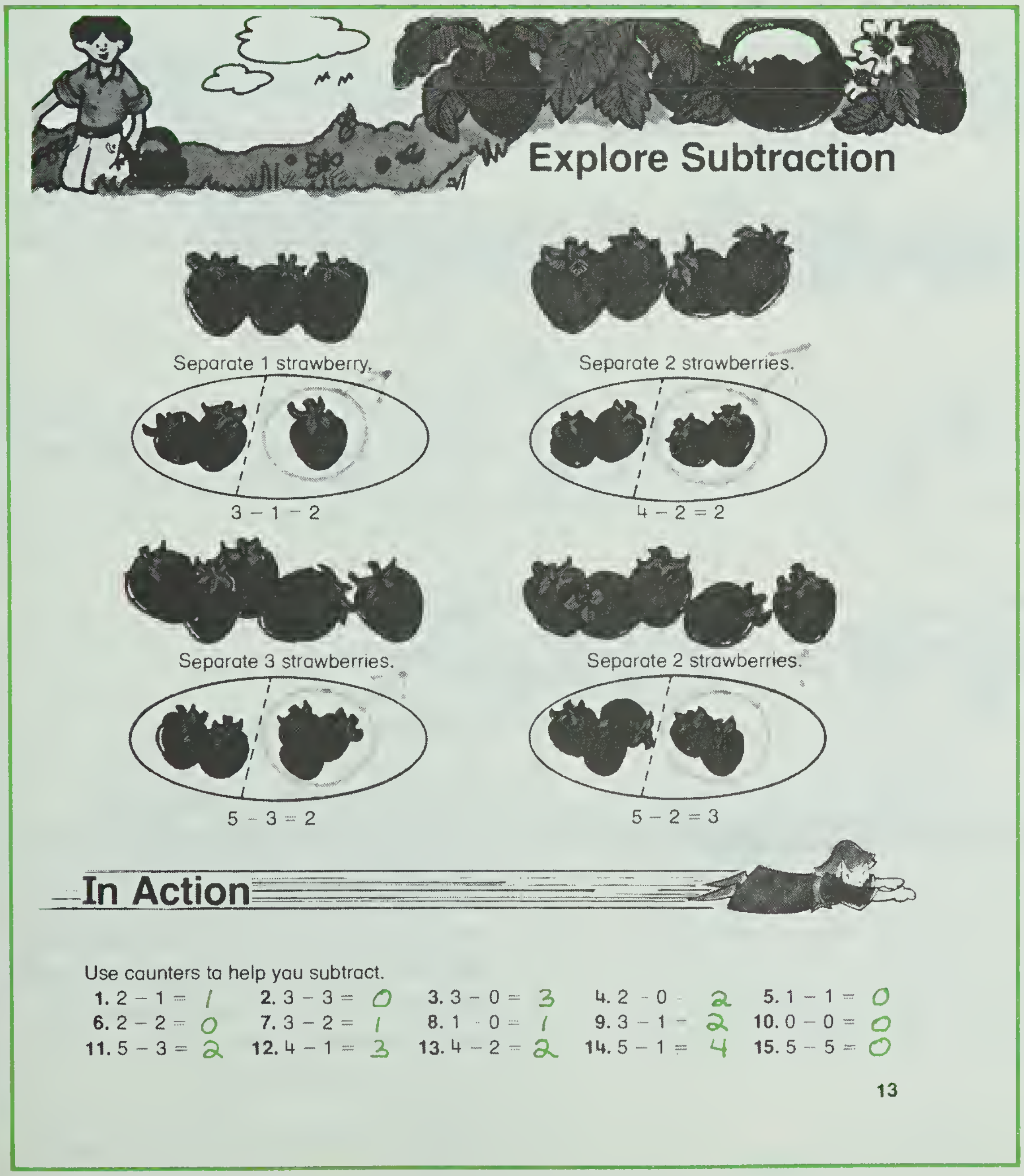
Discuss the examples and have children describe how to complete the In Action exercise.

☐ ☐

Give pairs or groups of children two sets of numeral cards from 0 to 6. In turn each child draws two cards, and the whole group records the appropriate subtraction sentence.

☐ ☐ ☐

mathways 3 Plus Workbook page 2



Explore Subtraction

Separate 1 strawberry.

3 − 1 = 2

Separate 2 strawberries.

4 − 2 = 2

Separate 3 strawberries.

5 − 3 = 2

Separate 2 strawberries.

5 − 2 = 3

In Action

Use counters to help you subtract.

1. 2 − 1 = 1 **2.** 3 − 3 = 0 **3.** 3 − 0 = 3 **4.** 2 − 0 = 2 **5.** 1 − 1 = 0
6. 2 − 2 = 0 **7.** 3 − 2 = 1 **8.** 1 − 0 = 1 **9.** 3 − 1 = 2 **10.** 0 − 0 = 0
11. 5 − 3 = 2 **12.** 4 − 1 = 3 **13.** 4 − 2 = 2 **14.** 5 − 1 = 4 **15.** 5 − 5 = 0

13

Unit 1 Section 1 Lesson 4

Recalling Addition and Subtraction Facts to Six: Fact Families

Materials

- for each child
  - six counters

Rationale

Learning families of number facts helps children understand addition and subtraction and the relationship between the two operations. In addition, fact families help make number facts easy to remember. The following are examples of two families of related facts:

4 + 1 = 5 5 − 1 = 4
1 + 4 = 5 5 − 4 = 1

2 + 2 = 4 4 − 2 = 2

Experience suggests that two such families are a reasonable number for a child to memorize at one time.

Lesson

1

Invite the children to join you in the working area and give each child six counters, saying

Make a set of five counters and a set of one counter.

Have a child write an addition sentence on the easel to show the groups of counters. Then have a child write another addition sentence to show the same groups of counters. Discuss that both sentences, 5+1=6 and 1+5=6, can be used to show joining a group of five counters and a group of one counter. Emphasize that the sum of 5+1 is the same as the sum of 1+5, and that the order of the numbers in an addition sentence does not change the sum.

2

How many counters are there when the group of five counters and the group of one counter are joined?
Take one counter away.
How many counters are left?

Have a child write the number sentence on the easel to show the subtraction.

6−1=5

Put the six counters together.
Take five counters away.
How many counters are left?
What number sentence shows what we have done?

Have a child write the sentence on the easel.

6−5=1

3

Tell the children that 5+1=6, 1+5=6, 6−1=5 and 6−5=1 are a family of addition and subtraction facts.

4

Repeat these activities for the following family of facts, paying special attention to the role of zero.

6+0=6 6−0=6
0+6=6 6−6=0

5

Repeat the activities for the following family of facts, emphasizing that there are only two number sentences.

3+3=6 6−3=3

Written and Other Activities

☐

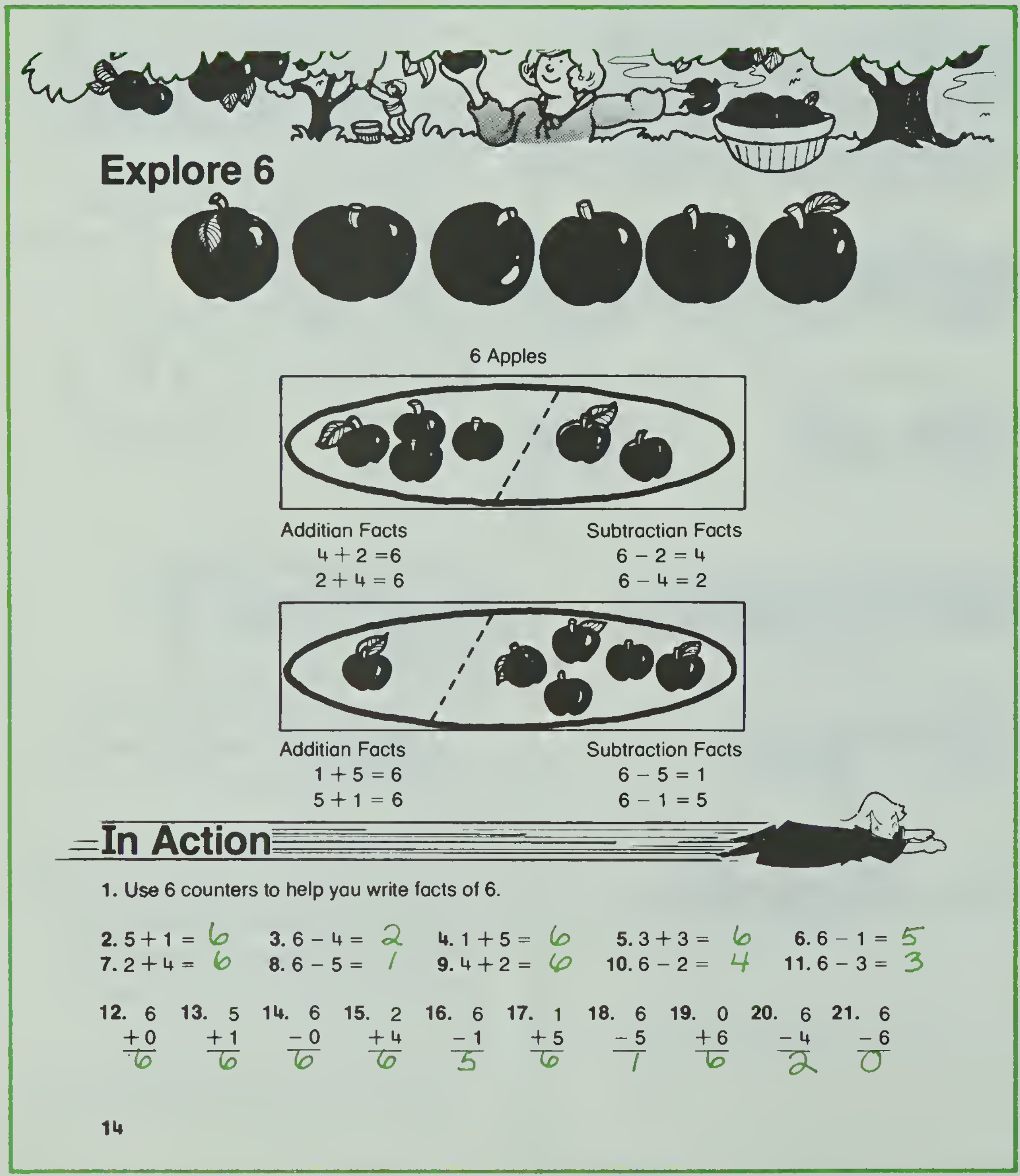
mathways 3, page 14

☐ ☐

Give each child five counters to separate into two groups. Then have the children write the family of addition and subtraction facts that are shown. Have them continue this until they have discovered all the families of addition and subtraction facts for 5. Use this activity for the families of facts for two, three and four.

☐ ☐ ☐

mathways 3 Practice Masters page 1



Explore 6

6 Apples

Addition Facts
4 + 2 = 6
2 + 4 = 6

Subtraction Facts
6 − 2 = 4
6 − 4 = 2

Addition Facts
1 + 5 = 6
5 + 1 = 6

Subtraction Facts
6 − 5 = 1
6 − 1 = 5

In Action

1. Use 6 counters to help you write facts of 6.

2. 5 + 1 = 6 3. 6 − 4 = 2 4. 1 + 5 = 6 5. 3 + 3 = 6 6. 6 − 1 = 5
7. 2 + 4 = 6 8. 6 − 5 = 1 9. 4 + 2 = 6 10. 6 − 2 = 4 11. 6 − 3 = 3

12. 6 + 0 = 6
13. 5 + 1 = 6
14. 6 − 0 = 6
15. 2 + 4 = 6
16. 6 − 1 = 5
17. 1 + 5 = 6
18. 6 − 5 = 1
19. 0 + 6 = 6
20. 6 − 4 = 2
21. 6 − 6 = 0

14

Unit 1 Section 1 Lesson 5

Exploring Addition and Subtraction Facts of Seven: Fact Families

Materials

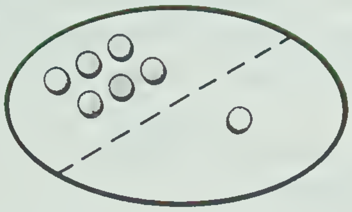
- numeral cards, 0 to 7
- chart paper
- for each child
  - – Fact Finder reproduced from Program Master 15
  - – seven counters
  - – blank 100-chart reproduced from Program Master 21

Lesson

1

Seat the children around the easel. Give each child a Fact Finder and seven counters.

Put six counters in one section of your Fact Finder and one counter in the other section.



What addition sentence is suggested by this placement of counters?

Record the sentence on the easel.

$6+1=7$

What other addition sentence is suggested by the same placement of counters?

Record the sentence on the easel.

$1+6=7$

What two subtraction sentences can we write to complete this fact family?

$6+1=7 \qquad 7-1=6$

$1+6=7 \qquad 7-6=1$

Have the children record the fact family in their notebooks.

2

Have the children move their counters on their Fact Finders so that there are four counters in one section and three in the other.

Repeat the questioning procedure described and record the second fact family on the easel while the children record it on paper.

$4+3=7 \qquad 7-3=4$

$3+4=7 \qquad 7-4=3$

Have the children continue to redistribute their counters until they have discovered and recorded all of the facts of seven.

3

Write 2, 5, 1, 7, 0, 4, 3, 6 across the top row and 4, 0, 3, 1, 6, 7, 2, 5 down the first column of the blank addition chart. Show the addition chart on the overhead projector. Distribute addition charts duplicated from Program Master 21 to the children. Then instruct them to complete their charts for the addends with sums to seven. They could use counters to help them find all the sums for the chart.

Written and Other Activities

☐

mathways 3, page 15

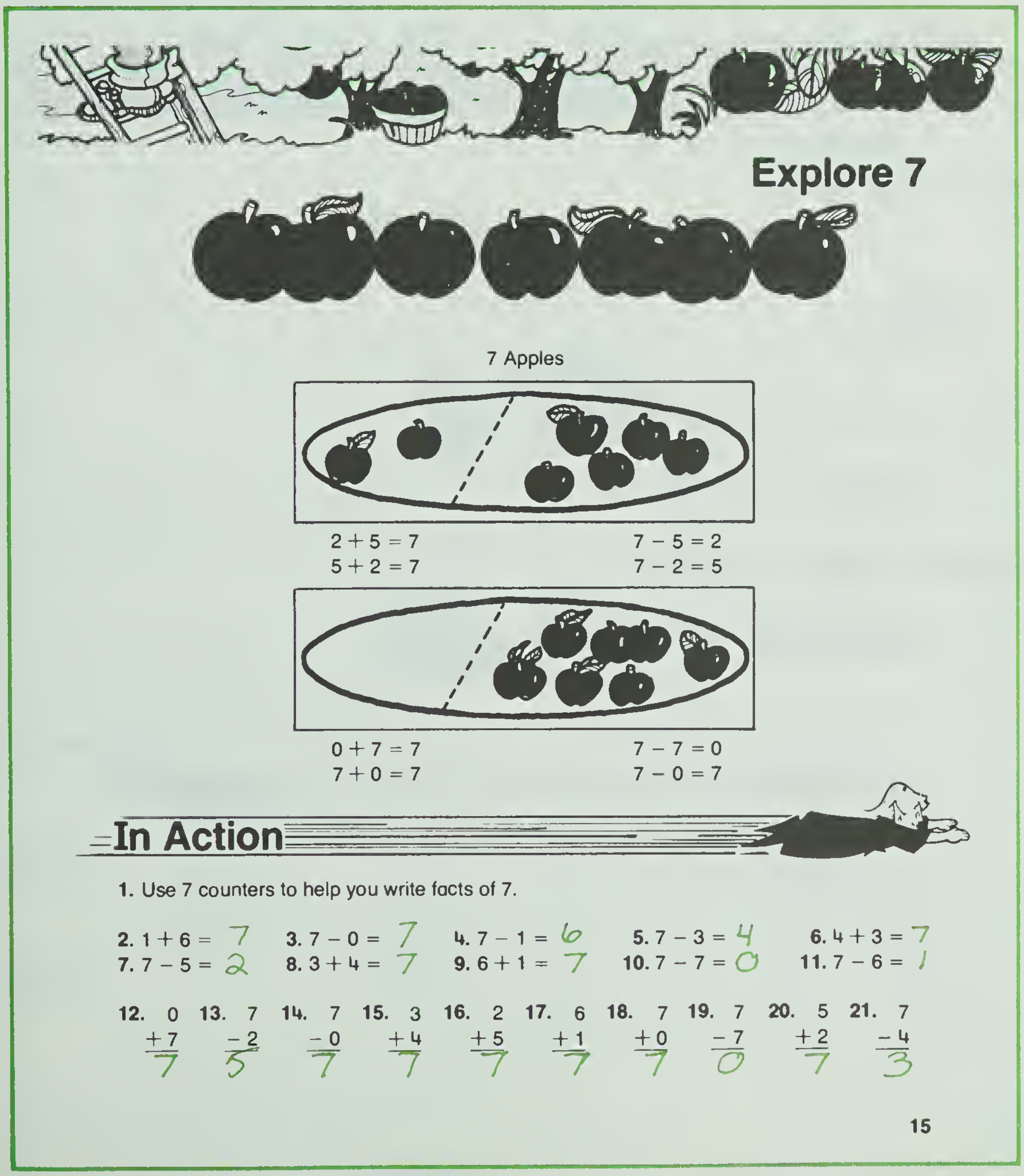
Give each child seven counters and a Fact Finder to do question 1.

☐ ☐

Prepare five cards for each numeral from 0 through 7 for a game with four players. The dealer shuffles the cards and turns over two cards. The first player to give the sum of the numbers shown claims the two cards. Then the dealer turns over two more cards. The dealer decides any disputes. The player with the most cards at the end of the time allowed for the game is the winner.

☐ ☐ ☐

Adapt the game in activity ☐ ☐ above for subtraction and have the players state the difference for the numbers shown.



Explore 7

7 Apples

2 + 5 = 7 7 − 5 = 2
5 + 2 = 7 7 − 2 = 5

0 + 7 = 7 7 − 7 = 0
7 + 0 = 7 7 − 0 = 7

In Action

1. Use 7 counters to help you write facts of 7.

2. 1 + 6 = 7 3. 7 − 0 = 7 4. 7 − 1 = 6 5. 7 − 3 = 4 6. 4 + 3 = 7
7. 7 − 5 = 2 8. 3 + 4 = 7 9. 6 + 1 = 7 10. 7 − 7 = 0 11. 7 − 6 = 1

12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
0	7	7	3	2	6	7	7	5	7
+7	−2	−0	+4	+5	+1	+0	−7	+2	−4
7	5	7	7	7	7	7	0	7	3

15

Unit 1 Section 1 Lesson 6

Exploring Addition and Subtraction Facts of Eight

Materials

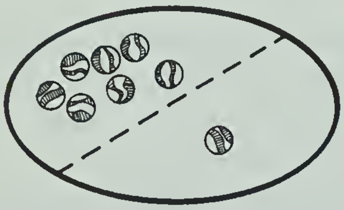
- gameboard for *Snakes and Ladders*
- die
- for each child
  - – Fact Finder, reproduced from Program Master 15
  - – eight counters

Lesson

1

Seat the children around the easel. Give each child a Fact Finder and eight counters.

Put seven counters in one section of your Fact Finder and one counter in the other section.



What addition sentence is suggested by this placement of counters?

Record the sentence on the easel.

7+1=8

What other addition sentence is suggested by the same placement of counters?

Record the sentence on the easel.

1+7=8

What two subtraction sentences can we write to complete this fact family?

7+1=8 *8−1=7*
1+7=8 *8−7=1*

Have the children record the family.

2

Write 4+4 on the easel. Have a child complete the number sentence and write the related subtraction sentence. Tell eight children to demonstrate the addition sentence and then the subtraction sentence. The addition 4+4=8 can be demonstrated by a group of four children being joined by another group of four children. The subtraction 8−4=4 can be shown by children forming a group of eight and then four of them leaving the group.

3

Write 7+1 on the easel. Have the children complete the family of related addition and subtraction facts. Then tell eight children to demonstrate each number sentence. Repeat this for 8+0.

Written and Other Activities

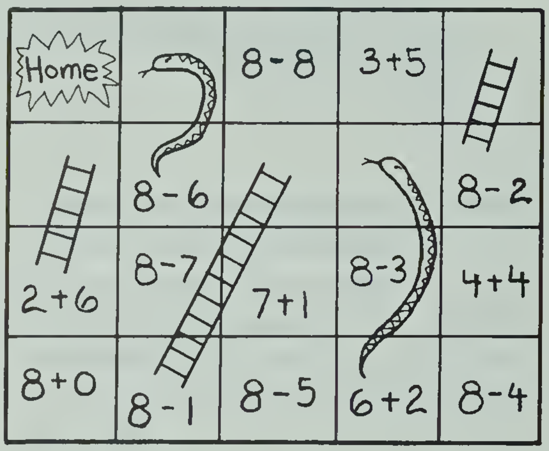
☐

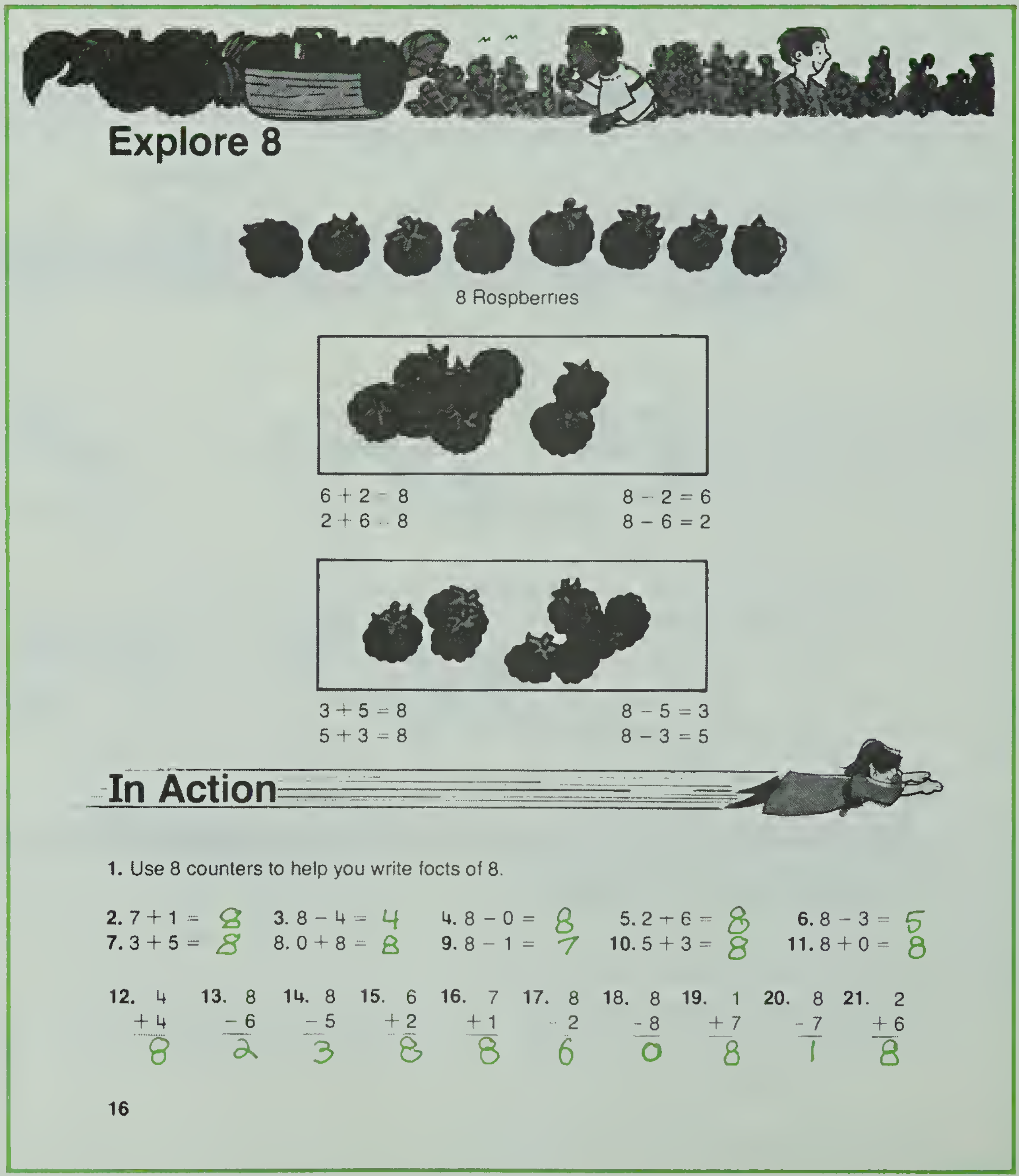
mathways 3, page 16

Give each child eight counters and a Fact Finder to do question 1.

☐ ☐

Make a gameboard and a die for *Snakes and Ladders*. Write an addition or subtraction exercise for the facts of eight on each spot except those at the beginning of a snake or at the end of a ladder. The first player throws the die and moves along the gameboard as indicated. A player who can complete the exercise on the spot where the die lands is able to stay there. A player who cannot complete the exercise misses a turn. A player who lands at the beginning of a snake must take that turn. The first player to reach the end of the path is the winner.





Explore 8

8 Raspberries

6 + 2 = 8
2 + 6 = 8

8 − 2 = 6
8 − 6 = 2

3 + 5 = 8
5 + 3 = 8

8 − 5 = 3
8 − 3 = 5

In Action

1. Use 8 counters to help you write facts of 8.

2. 7 + 1 = 8 **3.** 8 − 4 = 4 **4.** 8 − 0 = 8 **5.** 2 + 6 = 8 **6.** 8 − 3 = 5
7. 3 + 5 = 8 **8.** 0 + 8 = 8 **9.** 8 − 1 = 7 **10.** 5 + 3 = 8 **11.** 8 + 0 = 8

12. $\begin{array}{r} 4 \\ +4 \\ \hline 8 \end{array}$ **13.** $\begin{array}{r} 8 \\ -6 \\ \hline 2 \end{array}$ **14.** $\begin{array}{r} 8 \\ -5 \\ \hline 3 \end{array}$ **15.** $\begin{array}{r} 6 \\ +2 \\ \hline 8 \end{array}$ **16.** $\begin{array}{r} 7 \\ +1 \\ \hline 8 \end{array}$ **17.** $\begin{array}{r} 8 \\ -2 \\ \hline 6 \end{array}$ **18.** $\begin{array}{r} 8 \\ -8 \\ \hline 0 \end{array}$ **19.** $\begin{array}{r} 1 \\ +7 \\ \hline 8 \end{array}$ **20.** $\begin{array}{r} 8 \\ -7 \\ \hline 1 \end{array}$ **21.** $\begin{array}{r} 2 \\ +6 \\ \hline 8 \end{array}$

16

Unit 1 Section 1 Lesson 7

Exploring Facts of Eight: Adding Three Addends; Separating One Set into Three Sets

Materials

- counters
- *Concentration* cards, *see* ☐ ☐
- for each child
  - eight counters

Lesson

1

Seat the children around the easel. Display a set of two counters, a set of one counter and a set of three counters. Have a child join the set of two counters and the set of one counter and give the sum. Then have a child put the set of three counters with these sets and give the sum. Write on the easel.

$$\begin{array}{r}2\\1\\+3\\\hline 6\end{array}$$

Display the same sets of counters. Have a child join the sets in a different order and rewrite the addition question on the easel.

$$\begin{array}{r}2\\3\\+1\\\hline 6\end{array}$$

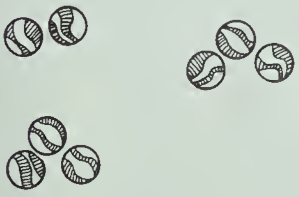
Repeat this for

$$\begin{array}{r}1\\2\\+3\\\hline 6\end{array}$$

Discuss the fact that the way the sets of counters are grouped does not change the sum.

2

Give each child up to eight counters. Have the children separate their sets into three sets, record the addends suggested by the three sets and find the sum.



$$\begin{array}{r}2\\3\\+3\\\hline 8\end{array}$$

Have each child repeat the procedure until all the various combinations of eight counters are exhausted.

Written and Other Activities

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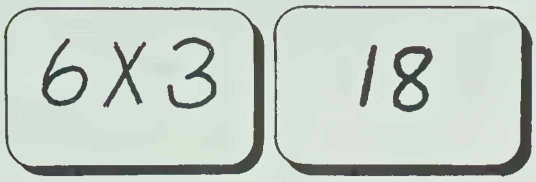
mathways 3, page 17

☐ ☐

Prepare 20 pairs of cards for the game *Concentration.*

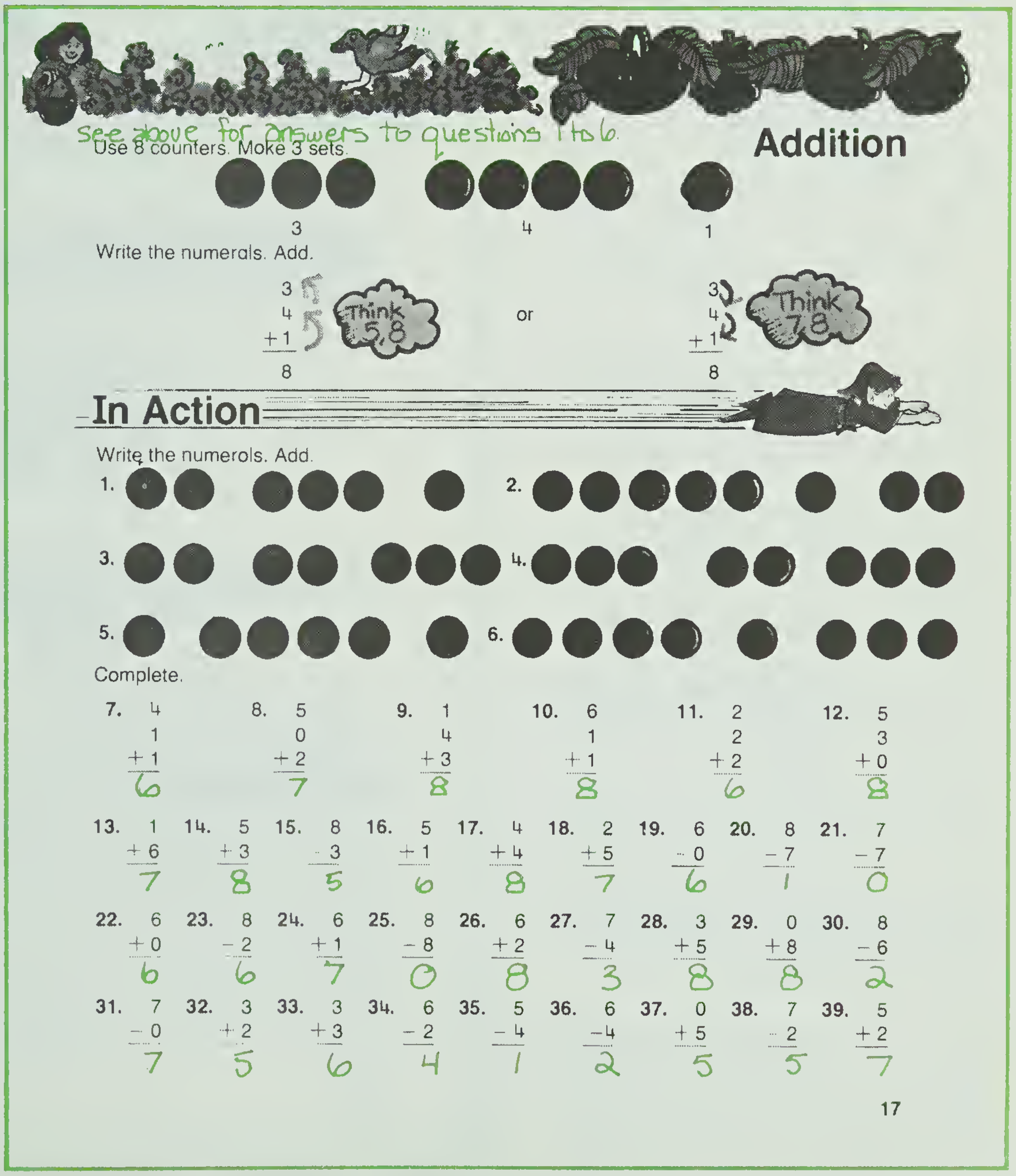


Three or four children can play the game. They place the cards in an array, face down on a table. A player turns over two cards. If the cards match, the player keeps the cards and turns over two other cards. This continues until the player turns over two cards that do not match. If the cards do not match, they are placed face down where they were on the table and it is the next player's turn. The player with the most cards after all the cards have been claimed is the winner.

Additional Answers

1. $\begin{array}{r}2\\3\\+1\\\hline 6\end{array}$ 2. $\begin{array}{r}5\\1\\+2\\\hline 8\end{array}$ 3. $\begin{array}{r}2\\2\\+3\\\hline 7\end{array}$

4. $\begin{array}{r}3\\2\\+3\\\hline 8\end{array}$ 5. $\begin{array}{r}1\\4\\+1\\\hline 6\end{array}$ 6. $\begin{array}{r}4\\1\\+3\\\hline 8\end{array}$



see above for answers to questions 1 to 6.

Use 8 counters. Moke 3 sets.

Addition

3 4 1

Write the numerals. Add.

$\begin{array}{r}3\\4\\+1\\\hline 8\end{array}$ Think 5,8 or $\begin{array}{r}3\\4\\+1\\\hline 8\end{array}$ Think 7,8

In Action

Write the numerals. Add.

1. 2\. 3\. 4\. 5\. 6\.

Complete.

7. $\begin{array}{r}4\\1\\+1\\\hline 6\end{array}$ 8. $\begin{array}{r}5\\0\\+2\\\hline 7\end{array}$ 9. $\begin{array}{r}1\\4\\+3\\\hline 8\end{array}$ 10. $\begin{array}{r}6\\1\\+1\\\hline 8\end{array}$ 11. $\begin{array}{r}2\\2\\+2\\\hline 6\end{array}$ 12. $\begin{array}{r}5\\3\\+0\\\hline 8\end{array}$

13. $\begin{array}{r}1\\+6\\\hline 7\end{array}$ 14. $\begin{array}{r}5\\+3\\\hline 8\end{array}$ 15. $\begin{array}{r}8\\-3\\\hline 5\end{array}$ 16. $\begin{array}{r}5\\+1\\\hline 6\end{array}$ 17. $\begin{array}{r}4\\+4\\\hline 8\end{array}$ 18. $\begin{array}{r}2\\+5\\\hline 7\end{array}$ 19. $\begin{array}{r}6\\-0\\\hline 6\end{array}$ 20. $\begin{array}{r}8\\-7\\\hline 1\end{array}$ 21. $\begin{array}{r}7\\-7\\\hline 0\end{array}$

22. $\begin{array}{r}6\\+0\\\hline 6\end{array}$ 23. $\begin{array}{r}8\\-2\\\hline 6\end{array}$ 24. $\begin{array}{r}6\\+1\\\hline 7\end{array}$ 25. $\begin{array}{r}8\\-8\\\hline 0\end{array}$ 26. $\begin{array}{r}6\\+2\\\hline 8\end{array}$ 27. $\begin{array}{r}7\\-4\\\hline 3\end{array}$ 28. $\begin{array}{r}3\\+5\\\hline 8\end{array}$ 29. $\begin{array}{r}0\\+8\\\hline 8\end{array}$ 30. $\begin{array}{r}8\\-6\\\hline 2\end{array}$

31. $\begin{array}{r}7\\-0\\\hline 7\end{array}$ 32. $\begin{array}{r}3\\+2\\\hline 5\end{array}$ 33. $\begin{array}{r}3\\+3\\\hline 6\end{array}$ 34. $\begin{array}{r}6\\-2\\\hline 4\end{array}$ 35. $\begin{array}{r}5\\-4\\\hline 1\end{array}$ 36. $\begin{array}{r}6\\-4\\\hline 2\end{array}$ 37. $\begin{array}{r}0\\+5\\\hline 5\end{array}$ 38. $\begin{array}{r}7\\-2\\\hline 5\end{array}$ 39. $\begin{array}{r}5\\+2\\\hline 7\end{array}$

17

Unit 1 Section 1 Lesson 8

Recalling Addition and Subtraction Facts of Nine and Ten

Materials

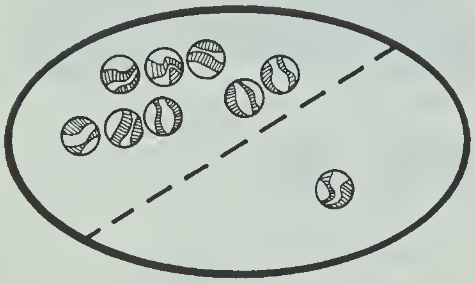
- number line
- three sets of numeral cards, 0 to 9
- for each child
  - – Fact Finder, reproduced from Program Master 15
  - – 10 counters
  - – number line
  - – copy of stencils, *see* ☐ ☐ ☐ ☐

Lesson

1

Seat the children around the easel. Give each child a Fact Finder and nine counters.

Put eight counters in one section of your Fact Finder and one counter in the other section.



What addition sentence is suggested by this placement of counters?

Record the sentence on the easel.

8 +1 =9

What other addition sentence is suggested by the same placement of counters?

Record the sentence on the easel.

1 +8 =9

What two subtraction sentences can we write to complete this fact family?

8 +1 =9 9 −1 =8

1 +8 =9 9 −8 =1

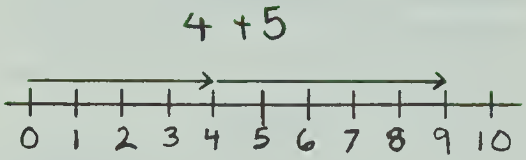
Have the children record the family.

2

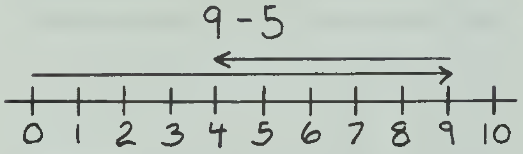
Have the children use 10 counters and their Fact Finders to discover and record the facts of 10.

3

Write *4 +5* on the easel. Have a child show the first addend on the number line; have another child show the second addend on the number line.



Ask a child to complete the addition sentence on the easel. Repeat this activity for 5+4=9, 9−5=4 and 9−4=5.



Written and Other Activities

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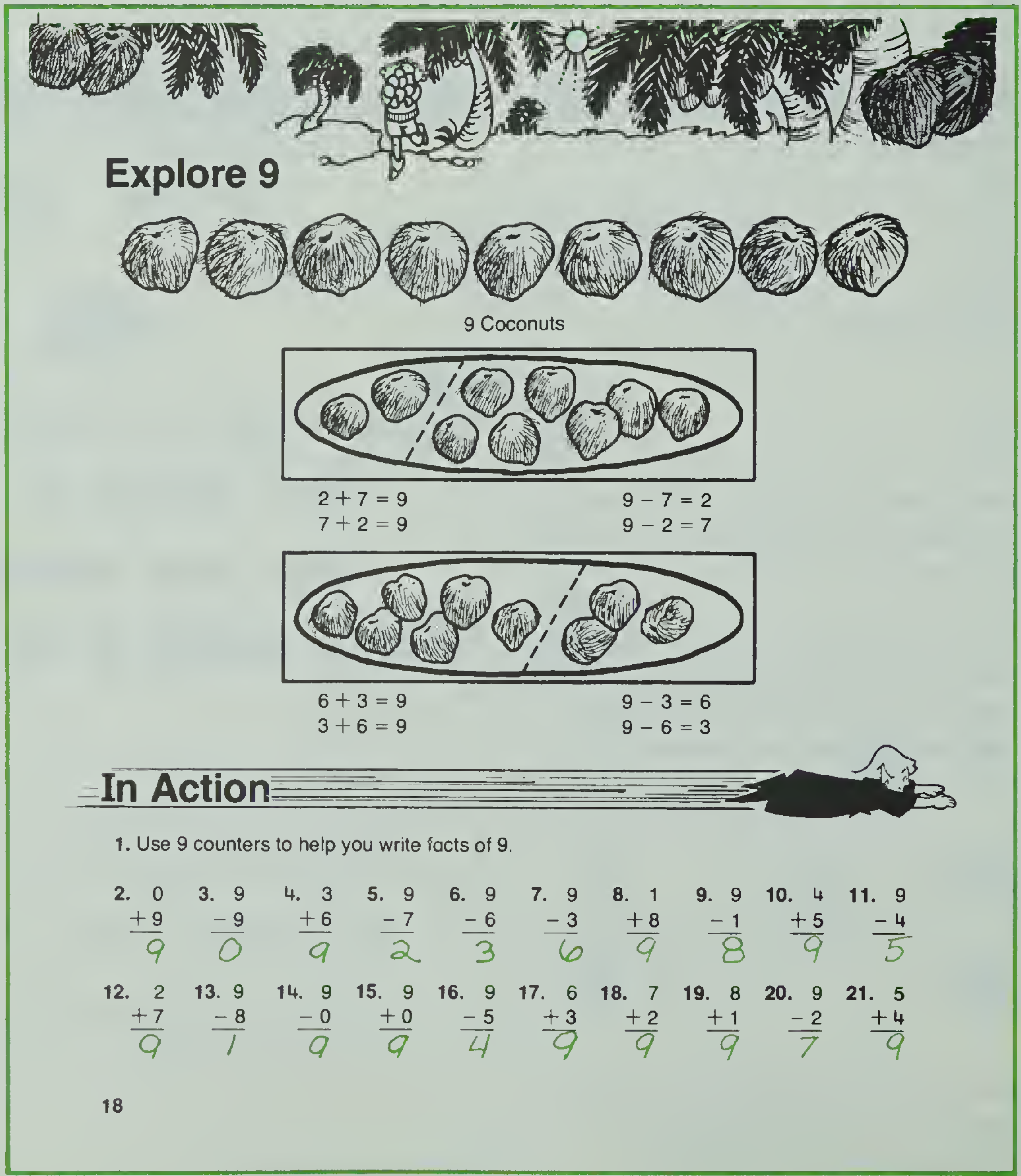
mathways 3, pages 18, 19

Give each child 10 counters and a Fact Finder to do question 1 on pages 18 and 19.

☐ ☐

Have the children show some of the exercises on pages 18 and 19 on number lines. The children can work in pairs. Each child draws a number line and arrows that indicate an addition or a subtraction sentence. The children exchange papers and write the number sentence suggested.



Explore 9

9 Coconuts

2 + 7 = 9
7 + 2 = 9
9 − 7 = 2
9 − 2 = 7

6 + 3 = 9
3 + 6 = 9
9 − 3 = 6
9 − 6 = 3

In Action

1. Use 9 counters to help you write facts of 9.

2. 0	3. 9	4. 3	5. 9	6. 9	7. 9	8. 1	9. 9	10. 4	11. 9
+9	−9	+6	−7	−6	−3	+8	−1	+5	−4
9	0	9	2	3	6	9	8	9	5
12. 2	13. 9	14. 9	15. 9	16. 9	17. 6	18. 7	19. 8	20. 9	21. 5
+7	−8	−0	+0	−5	+3	+2	+1	−2	+4
9	1	9	9	4	9	9	9	7	9

18

☐ ☐ ☐

Prepare 30 cards, three for each numeral from 0 to 9. A player shuffles the cards and places them face down in the centre of a group of four players. In turn, each player draws a card, names the number shown, and then states the number that, combined with the drawn number, gives a sum of 10. Vary this activity for sums of eight and nine.

☐ ☐ ☐ ☐

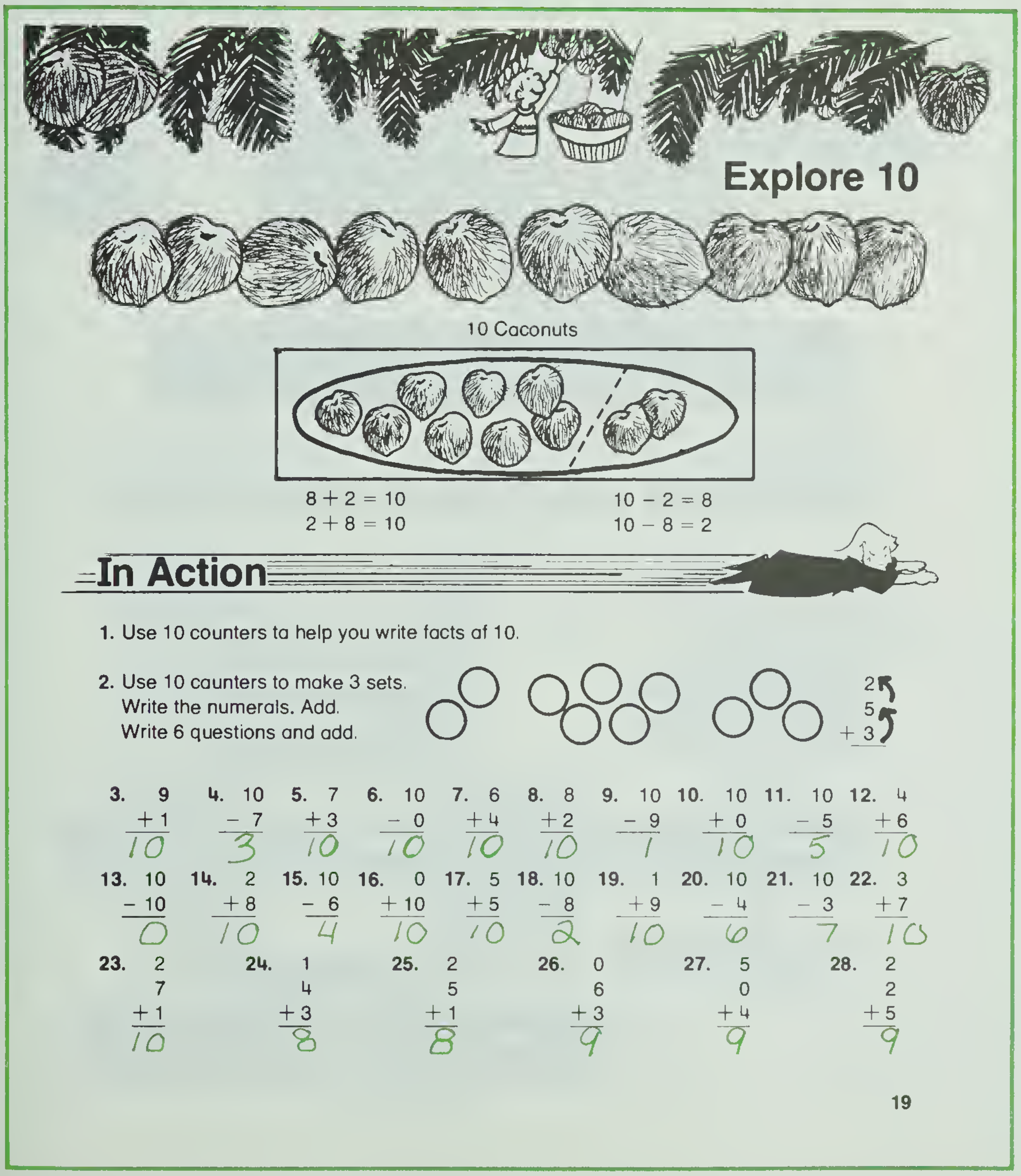
Make stencils with the following exercises for the children to complete with the symbol + or −.

7 ☐ 2 = 9
10 ☐ 4 = 6
1 ☐ 7 = 8
10 ☐ 1 = 9
2 ☐ 1 = 3
9 ☐ 6 = 3

9 ☐ 3 = 6
5 ☐ 5 = 10
1 ☐ 8 = 9
4 ☐ 2 = 2
0 ☐ 10 = 10
10 ☐ 8 = 2

4 ☐ 6 = 10
10 ☐ 5 = 5
10 ☐ 10 = 0
5 ☐ 2 = 7
0 ☐ 9 = 9
1 ☐ 1 = 2

8 ☐ 4 = 4
9 ☐ 9 = 0
8 ☐ 1 = 9
6 ☐ 5 = 1
7 ☐ 3 = 10
7 ☐ 4 = 3



Explore 10

10 Coconuts

8 + 2 = 10
2 + 8 = 10

10 − 2 = 8
10 − 8 = 2

In Action

1. Use 10 counters to help you write facts of 10.
2. Use 10 counters to make 3 sets. Write the numerals. Add. Write 6 questions and add.

3.	9	+ 1	10
4.	10	− 7	3
5.	7	+ 3	10
6.	10	− 0	10
7.	6	+ 4	10
8.	8	+ 2	10
9.	10	− 9	1
10.	10	+ 0	10
11.	10	− 5	5
12.	4	+ 6	10
13.	10	− 10	0
14.	2	+ 8	10
15.	10	− 6	4
16.	0	+ 10	10
17.	5	+ 5	10
18.	10	− 8	2
19.	1	+ 9	10
20.	10	− 4	6
21.	10	− 3	7
22.	3	+ 7	10

23.	2	7	+ 1	10
24.	1	4	+ 3	8
25.	2	5	+ 1	8
26.	0	6	+ 3	9
27.	5	0	+ 4	9
28.	2	2	+ 5	9

19

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mathways 3 Practice Masters page 2
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mathways 3 Plus Workbook page 3

Unit 1 Section 2 Lesson 1

Exploring Tens: Grouping by Tens

Materials

- 90 sticks
- for each child
  - elastic bands
  - place-value mat, reproduced from Program Master 16
  - place-value material, made from Program Master 19

Rationale

It is essential that children develop a sound understanding of place value, since it is this concept that underlies writing numerals to show whole numbers and decimals, and regrouping in addition, subtraction, multiplication and division. For example, in the base 10 system, a numeral representing a number from 10 to 99 has a digit in the ones place, and a digit in the tens place that represents the number of groups of ten. The system of grouping by tens is extended to the left of the tens place for numbers greater than 99.

It is important that children begin their work with two-digit numbers by using concrete place-value materials on place-value mats. There are many such place-value materials, and using a variety of them helps children to understand regrouping. To begin with, however, children should bundle place-value rods or coffee sticks into groups of 10. Later they can move to bean sticks, nail bottles, bead strips, base 10 materials or 10-strips and unit strips made from cardboard.

For a more complete description of place-value materials, refer to page 6 of the Overview.

Whatever materials are illustrated in the children's text or in the Teacher's Resource Manual — whether bundles, bean sticks, bead strips or cardboard models — they shall be referred to as 100-flats, 10-strips and ones for convenience and clarity.

Lesson

1

Invite the children into the working area. Display 10 sticks. Have a child count the sticks and put an elastic band around them.

How many sticks are in the bundle?

How many tens are shown by the bundle?

Place the bundle in the tens column of a place-value mat, explaining that one bundle of 10 sticks means 1 ten and that 1 ten means 10 ones. Write on the easel

1 ten 10

2

Display four bundles of 10 sticks and ask

How many tens are shown by these bundles?

Place the bundles in the tens column of the place-value mat. Write on the easel

4 tens

and ask

What number does this show?

When a child has responded correctly, write 40 on the easel. Repeat the activity to illustrate other multiples of 10, from 20 to 90.

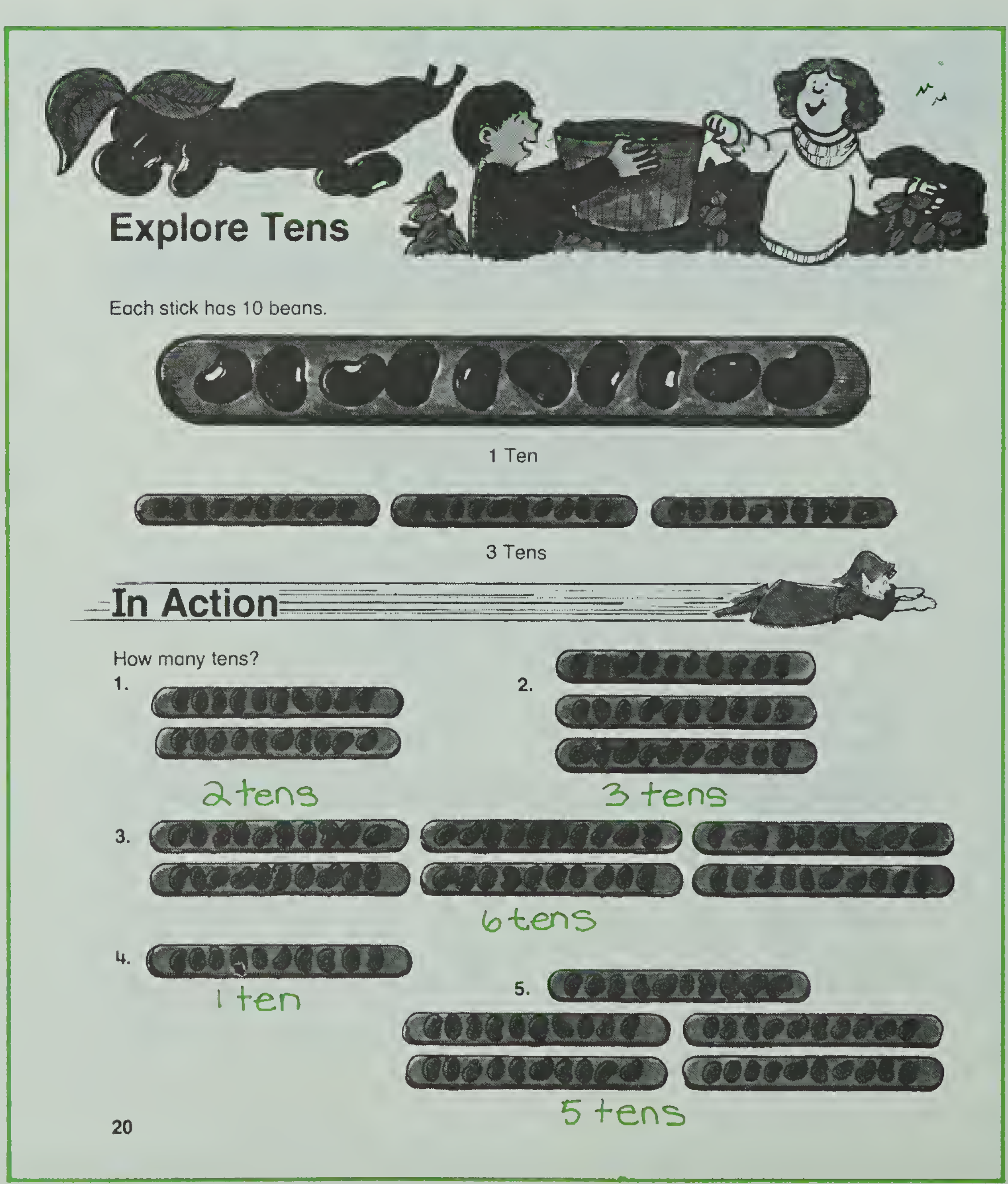
3

Introduce the children to place-value material and place a quantity representing tens in the centre of the working area. Give each child a place-value mat. Then, place three 10-strips in the tens column of a mat.

How many tens are shown?

Write on the easel

3 tens



Explore Tens

Each stick has 10 beans.

1 Ten

3 Tens

In Action

How many tens?

1. 2tens

2. 3 tens

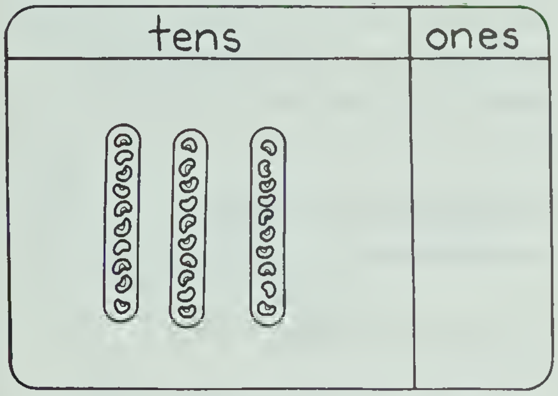
3. 6 tens

4. 1 ten

5. 5 tens

20

and ask
What number does this show?



Allowing time for a child to respond, write 30 on the easel. Repeat to illustrate other multiples of 10 to 90. Then have the children take turns illustrating a number on a place-value mat and asking the group to identify the number shown.

Written and Other Activities

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mathways 3, pages 20, 21
Before assigning the In Action exercises, invite children to explain the examples given at the top of each page. Have one or two children tell how they will complete the exercises. Allow them to use place-value mats and 10-strips. When the exercises have been completed, have several children explain the place-value meaning of the numerals they have written.

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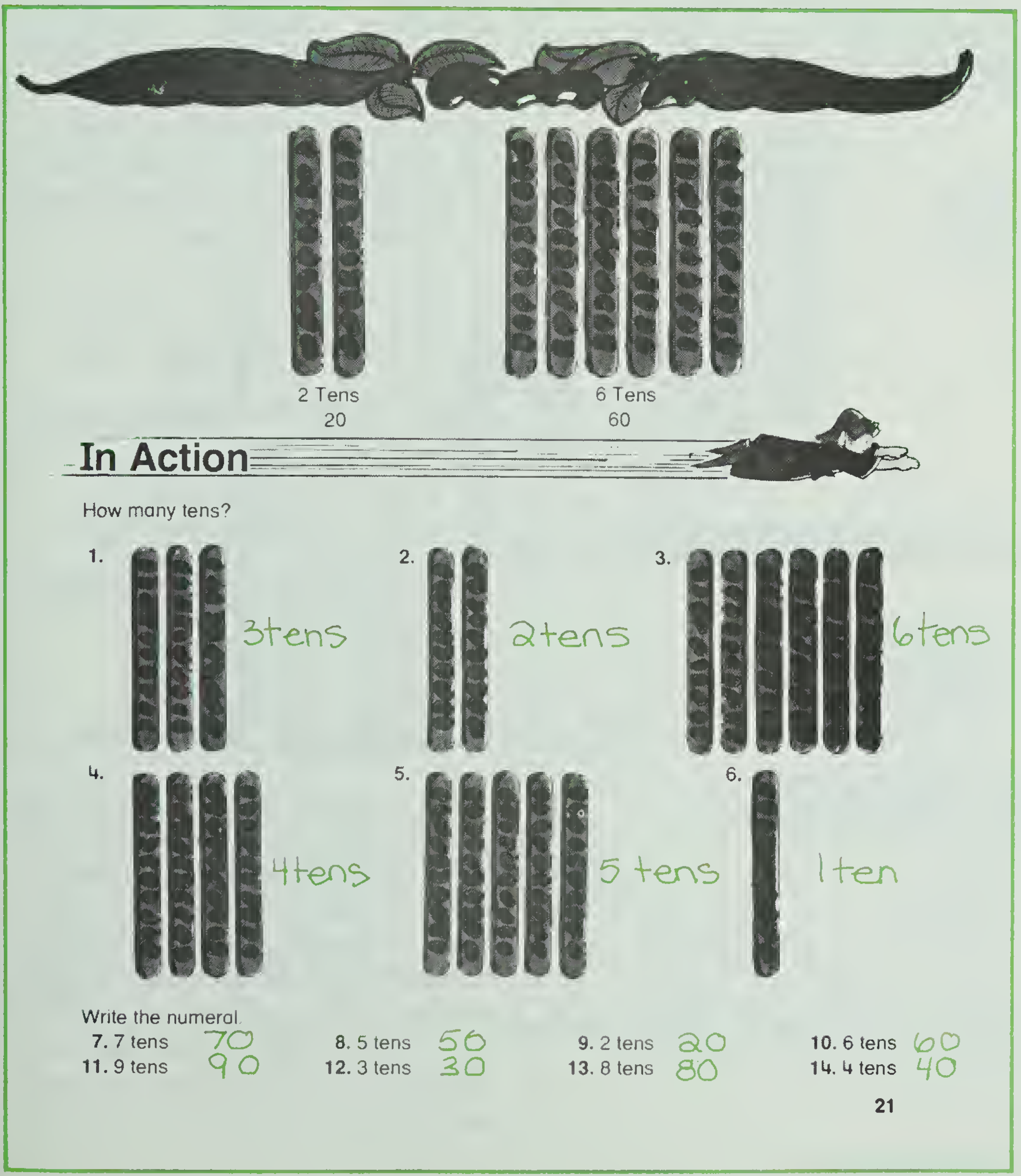
mathways 3 Plus Workbook page 4

For Your Notes



2 Tens
20

6 Tens
60

In Action

How many tens?

1. 3tens
2. 2tens
3. 6tens
4. 4tens
5. 5 tens
6. 1 ten

Write the numeral.

7. 7 tens 70
8. 5 tens 50
9. 2 tens 20
10. 6 tens 60
11. 9 tens 90
12. 3 tens 30
13. 8 tens 80
14. 4 tens 40

21

Unit 1 Section 2 Lesson 2

Exploring Tens and Ones

Materials

- place-value material
- place-value cards for two-digit numbers
- for each child
  - place-value mat, reproduced from Program Master 16

Lesson

1

Gather the children around the working area. Give each child a place-value mat.

Put five 10-strips on a place-value mat. Explain that each 10-strip means 1 ten. Ask

How many tens are shown?

Write *5 tens* on the easel.

What number does this mean?

Write *50* on the easel.

Have the children illustrate various multiples of 10 on their mats.

2

Put three 10-strips and four unit strips on the place-value mat. Ask

How many tens are shown?

How many ones are shown?

Write *3 tens and 4* on the easel. Ask

What number does this mean?

Write *34* on the easel. Repeat this activity for several numbers from 11 to 99, each time having the children use place-value materials on their mats to illustrate the number.

3

Write 72 on the easel.

How many tens are shown?

How many ones are shown?

Write *7 tens and 2* on the easel. Have all the children put 10-strips and unit strips on their place-value mats to show 72. Repeat this for several numbers from 11 to 99.

Written and Other Activities

☐

mathways 3, page 22

☐ ☐

For experience in representing numbers with semi-concrete materials, children can draw 10-strips and unit strips to show some of the numerals on page 22.

It is possible to prepare place-value templates for the children by cutting strips and units from regions of cardboard.

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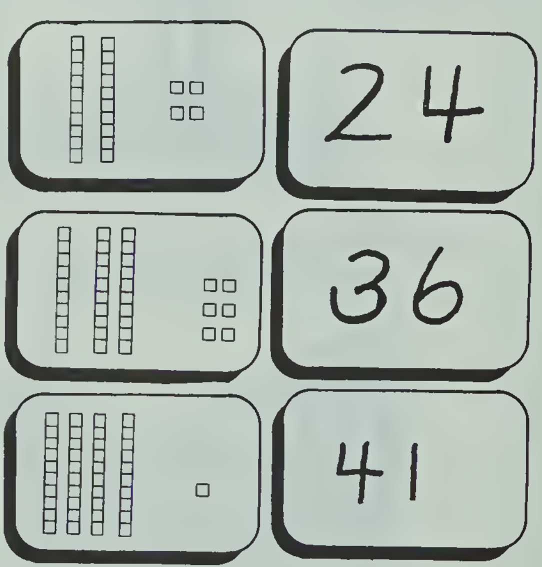
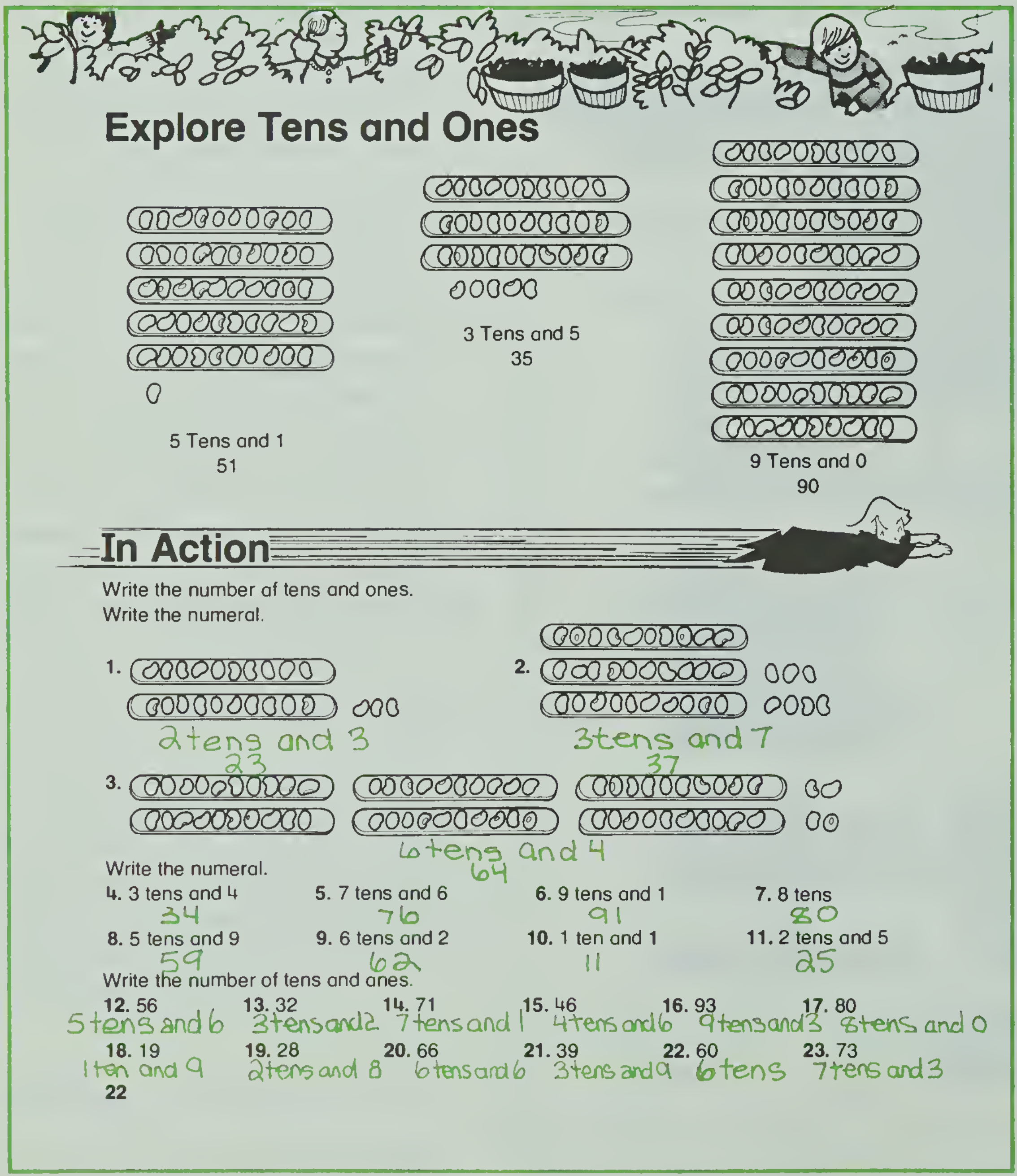
Make several place-value cards by gluing cardboard 10-strips and unit strips on the front of a card and writing the numeral on the back.



These cards can be used in an activity centre. A child looks at the front of the card, writes the numeral and then checks by looking at the back of the card. The cards can be used for a game in which one child displays the front of the card for a small group of children. The child who says the number first takes the card. When all the cards have been taken, the child with the most cards is the winner.



Explore Tens and Ones

5 Tens and 1
51

3 Tens and 5
35

9 Tens and 0
90

In Action

Write the number of tens and ones.
Write the numeral.

1. 2tens and 3
23

2. 3tens and 7
37

3. 6tens and 4
64

Write the numeral.

4. 3 tens and 4 — 34
5. 7 tens and 6 — 76
6. 9 tens and 1 — 91
7. 8 tens — 80
8. 5 tens and 9 — 59
9. 6 tens and 2 — 62
10. 1 ten and 1 — 11
11. 2 tens and 5 — 25

Write the number of tens and ones.

12. 56 — 5tens and 6
13. 32 — 3tensand2
14. 71 — 7tens and 1
15. 46 — 4tens and6
16. 93 — 9tensand3
17. 80 — 8tens and 0
18. 19 — 1ten and 9
19. 28 — 2tens and 8
20. 66 — 6tensand6
21. 39 — 3tens and9
22. 60 — 6tens
23. 73 — 7tens and3

22

Unit 1 Section 2 Lesson 3

Relating Dimes to Tens and Pennies to Ones, Recalling the Symbol ¢

Materials

- pennies
- dimes
- classroom objects
- old toys
- price tags
- box
- play money reproduced from Program Masters 8-11
- for each pair of children
  - newspapers or catalogues
  - glue
  - construction paper
  - pair of scissors
- for groups of four
  - coloured numeral cards: one green set of numerals 0 to 9; one yellow set of numerals 1 to 9
  - 10-strips and unit strips

Lesson

1

Seat the children around the working area. Display pennies and dimes. Encourage the children to examine the coins and discuss details about them. Some discussion points might include the material used to make the coins, the year each coin was minted, the illustrations on both sides and the value of the coin. Have a child count 10 pennies and place them beside a dime. Recall that 10 pennies have the same value as one dime. Write 10¢ on the easel and review the meaning of the symbol ¢.

2

Display one dime and six pennies.

How many dimes are there?

How many pennies are there?

How many tens and ones does this mean?

Record *1 ten and 6* on the easel. Have a child write *16¢* on the easel to show the amount of money. Repeat this with other amounts from 1¢ to 99¢.

3

Write *28¢* on the easel and have the children select the number of dimes and pennies for this amount. Have them use as many dimes as possible so that 28¢ is shown by two dimes and eight pennies, not 28 pennies or one dime and 18 pennies.

Repeat this for several other amounts from 10¢ to 99¢.

4

Have the children cut advertisements for articles costing from 1¢ to 99¢ from a newspaper or catalogue and glue each on a piece of cardboard. Alternatively, have children draw an item and label it with a price of from 1¢ to 99¢. Place these cards in a box. Each child selects one and counts the number of dimes and pennies required, using as many dimes as possible.

Written and Other Activities

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mathways 3, page 23

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Start a play store in the classroom. Items for sale can be objects that are in the room or old toys the children bring to school. Another possibility would be to have the children make articles for the store during an art lesson or at an art activity centre. Label the items with price tags showing amounts from 1¢ to 99¢. Children can take turns being the storekeeper and others can use play money to pay the exact amount for an article.

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mathways 3 Practice Masters page 3

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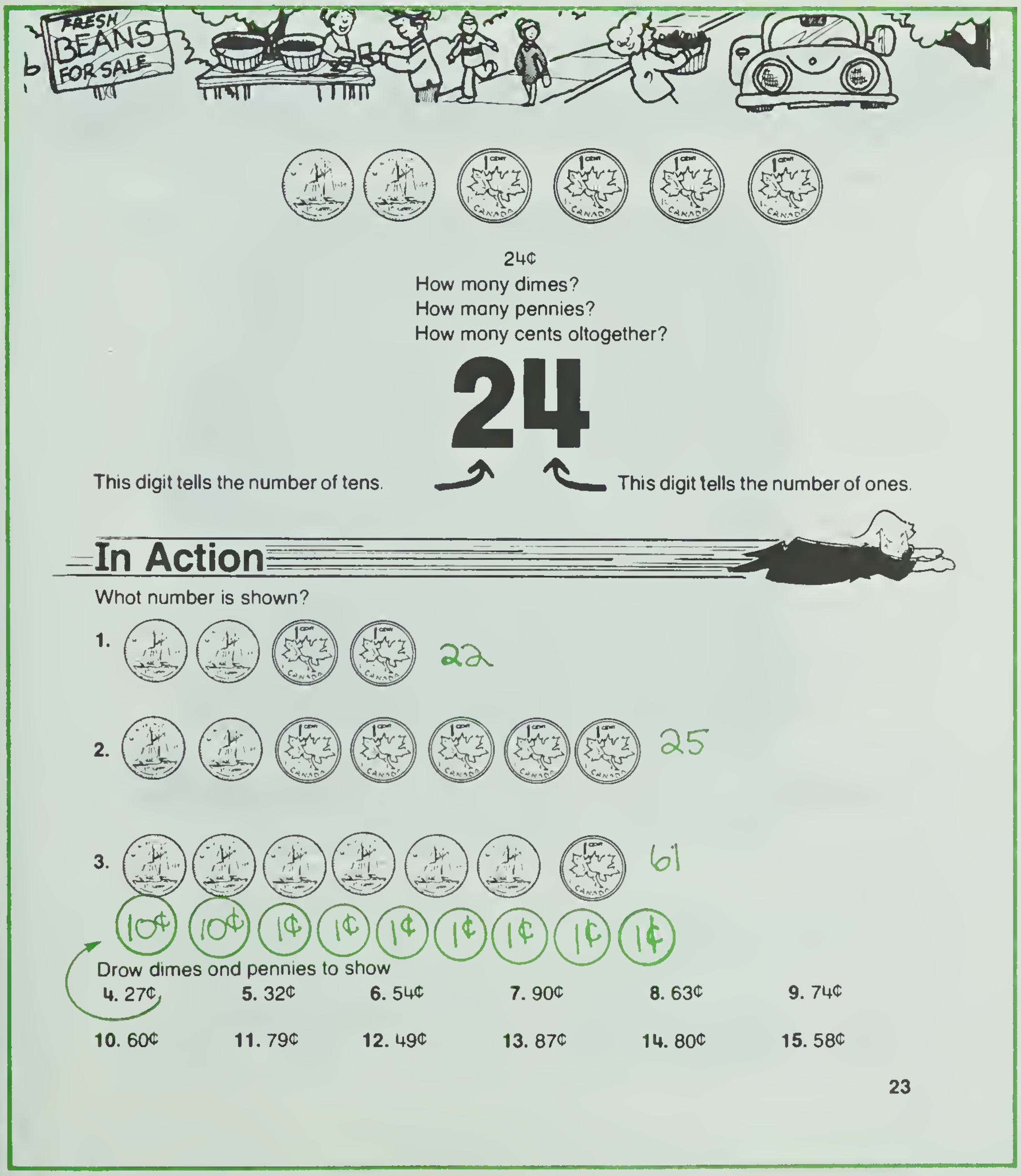
mathways 3 Plus Workbook page 5



24¢

How many dimes?

How many pennies?

How many cents altogether?

24

This digit tells the number of tens.

This digit tells the number of ones.

In Action

What number is shown?

1. 22
2. 25
3. 61

10¢ 10¢ 1¢ 1¢ 1¢ 1¢ 1¢ 1¢ 1¢

Draw dimes and pennies to show

4. 27¢ 5. 32¢ 6. 54¢ 7. 90¢ 8. 63¢ 9. 74¢

10. 60¢ 11. 79¢ 12. 49¢ 13. 87¢ 14. 80¢ 15. 58¢

23

Unit 1 Section 2 Lesson 4

Sequencing Numbers to 100: Numbers Before, After and Between; One Greater Than, One Less Than

Materials

- One Hundred Board
- numeral tags
- for each child
  - blank 100-chart reproduced from Program Master 21
  - crayons

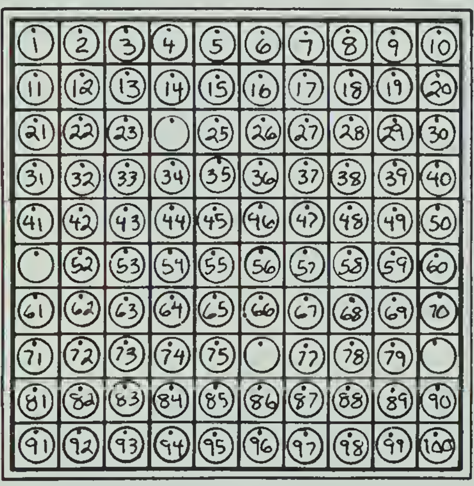
Lesson

1

Seat the children around the working area. Have a child begin to count by ones. Then tell the child to stop counting and ask another to continue to count. Continue this until the children have counted to 100.

2

Display the One Hundred Board with several of the numeral tags face down. Point to each of these in turn, refer to the number before and after it and have a child state the missing number. Check each answer by turning the tag over.



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23		25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75		77	78	79	
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

3

Have the children comment on number patterns on the One Hundred Board. They may mention that the digits in the ones places of the numerals in a column are the same or that the first nine numerals in each row have the same digit in the tens places. Other patterns children may notice are that when going diagonally from the top left to the bottom right or from the bottom left to the top right the digits in the ones places increase by one.

4

Ask a child

What number is one greater than 23?

Refer to the One Hundred Board to check the response. Repeat this a few times.

5

Ask a child

What number is one less than 38?

Have the child point to 38, then 37 on the Board. Repeat this a few times.

6

Write two numerals such as 15 and 24 on the easel and have the children list in order all the numerals between them. As a variation, write numerals such as 94 and 87 and have the children list the numerals in reverse order, beginning with 93.

Written and Other Activities

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mathways 3, pages 24, 25

☐ ☐

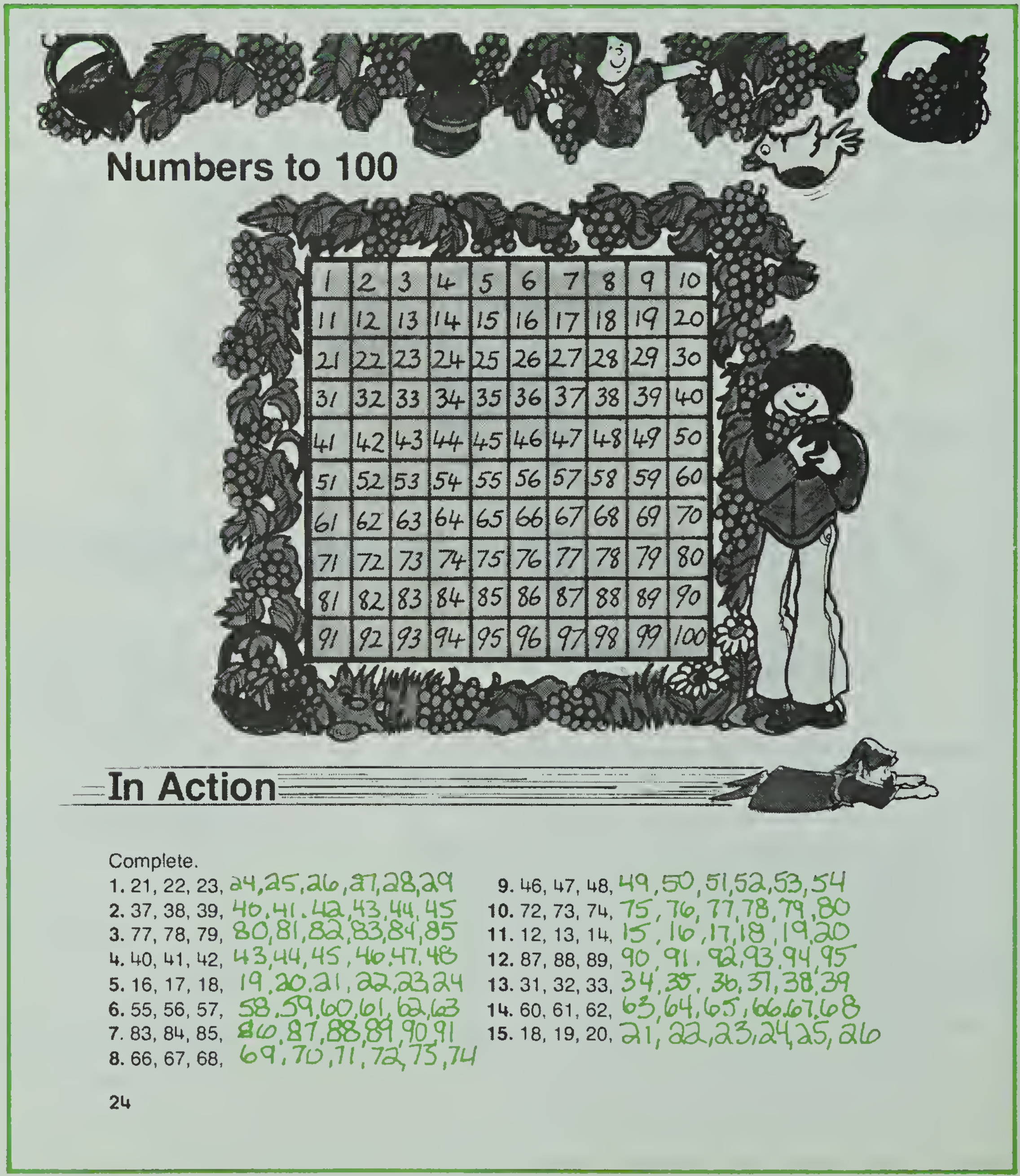
Give each child a copy of a blank 100-square. Instruct the children as follows:

Colour the square where the numeral after 63 would go.

Colour the square for the numeral that is one less than 52.

Colour the square for the numeral between 19 and 21.

Continue this until several of the squares have been coloured.



Numbers to 100

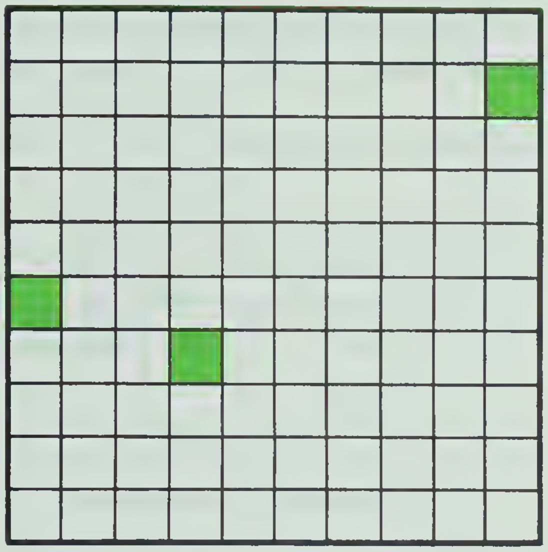
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

In Action

Complete.

1. 21, 22, 23, 24, 25, 26, 27, 28, 29
2. 37, 38, 39, 40, 41. 42, 43, 44, 45
3. 77, 78, 79, 80, 81, 82, 83, 84, 85
4. 40, 41, 42, 43, 44, 45, 46, 47, 48
5. 16, 17, 18, 19, 20. 21, 22, 23, 24
6. 55, 56, 57, 58, 59, 60, 61, 62, 63
7. 83, 84, 85, 86, 87, 88, 89, 90, 91
8. 66, 67, 68, 69, 70, 71, 72, 73, 74
9. 46, 47, 48, 49, 50, 51, 52, 53, 54
10. 72, 73, 74, 75, 76, 77, 78, 79, 80
11. 12, 13, 14, 15, 16, 17, 18, 19, 20
12. 87, 88, 89, 90, 91, 92, 93, 94, 95
13. 31, 32, 33, 34, 35, 36, 37, 38, 39
14. 60, 61, 62, 63, 64, 65, 66, 67, 68
15. 18, 19, 20, 21, 22, 23, 24, 25, 26

24



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Divide the class into groups of about five. One child asks a question such as *What number is one less than 50?* The first child to answer asks the next question.

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mathways 3 Practice Masters page 4

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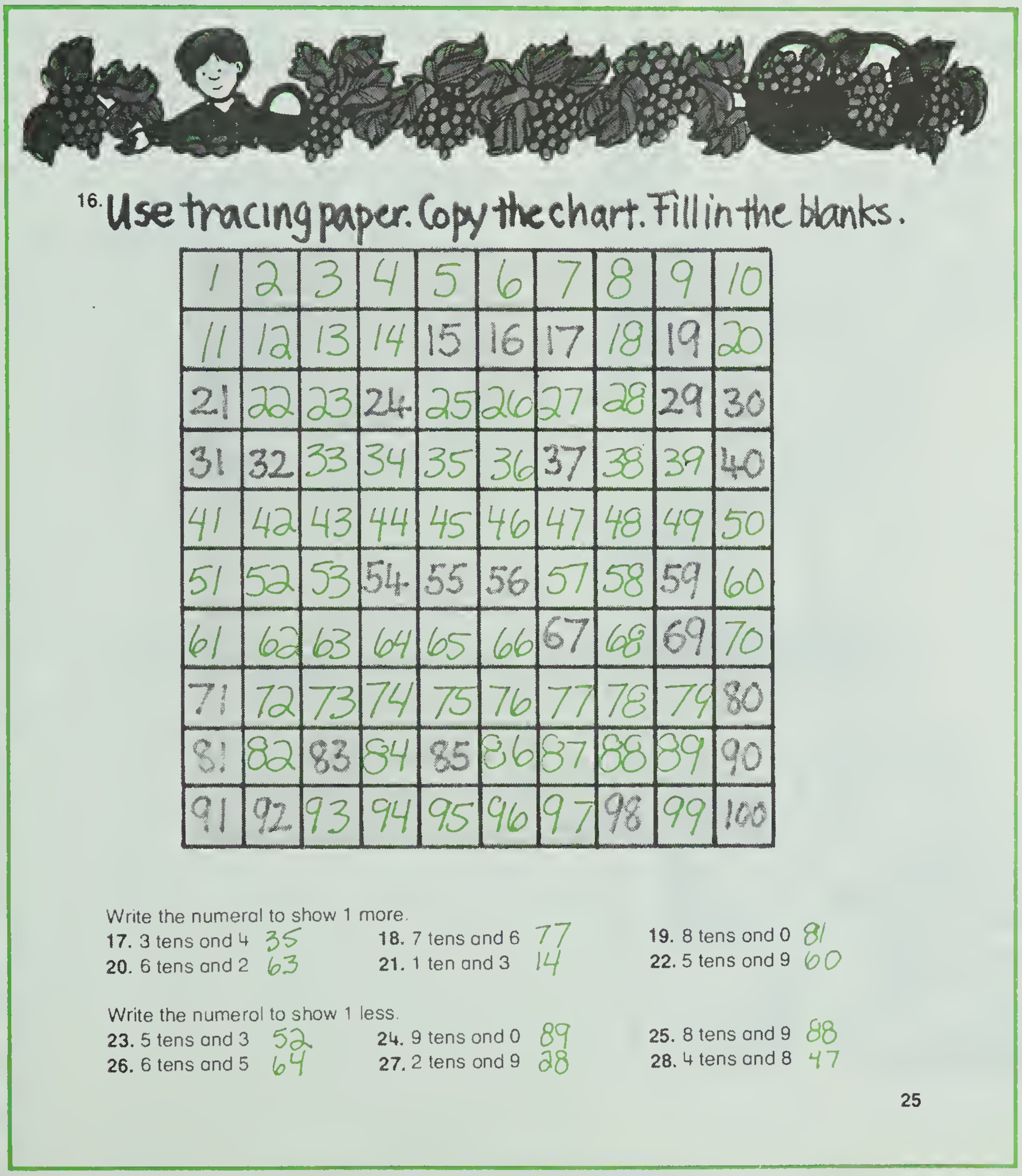
mathways 3 Plus Workbook page 6

For Your Notes



16. Use tracing paper. Copy the chart. Fill in the blanks.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Write the numeral to show 1 more.

17. 3 tens and 4 35

18. 7 tens and 6 77

19. 8 tens and 0 81

20. 6 tens and 2 63

21. 1 ten and 3 14

22. 5 tens and 9 60

Write the numeral to show 1 less.

23. 5 tens and 3 52

24. 9 tens and 0 89

25. 8 tens and 9 88

26. 6 tens and 5 64

27. 2 tens and 9 28

28. 4 tens and 8 47

25

Unit 1 Section 2 Lesson 5

Byway: Making Up Clues; Guessing the Number

Materials

- blank cards
- One Hundred Board

Lesson

1

Gather the children around the easel. Write the numeral 36.

What is the digit in the ones place?
What is the digit in the tens place?
What is the sum of the two digits?
What is the difference between the two digits?
Which is less, the digit in the ones place or the digit in the tens place?
Which digit is greater?

2

Write the numeral 51 on the easel. Have the children ask questions about it, such as those asked in the preceding activity. Repeat this with a few other numerals.

3

Write a number puzzle such as this one on the easel.

The number is between 20 and 50.
The ones digit is 6 greater than the tens digit.
The sum of the two digits is 12.
What is the number?

Discuss the clues with the children. Have them solve the puzzle.

Written and Other Activities

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mathways 3, page 26

☐ ☐

Likely it would be wise to solve the puzzles on page 26 as a group. Have each puzzle read aloud. The One Hundred Board will be very helpful in working through the given clues.

☐ ☐

Have each child select a number and write four descriptive clues about it. The clues can be written on the front of a card and the numeral on the back of the card. Place the cards in a box for children to use as a guessing activity for the class or for individual children. Alternatively, groups of about six children can use the cards to play the following game: The leader reads the clues for 10 numbers and the players write the numerals. The player who has written the most correct numerals is the winner.

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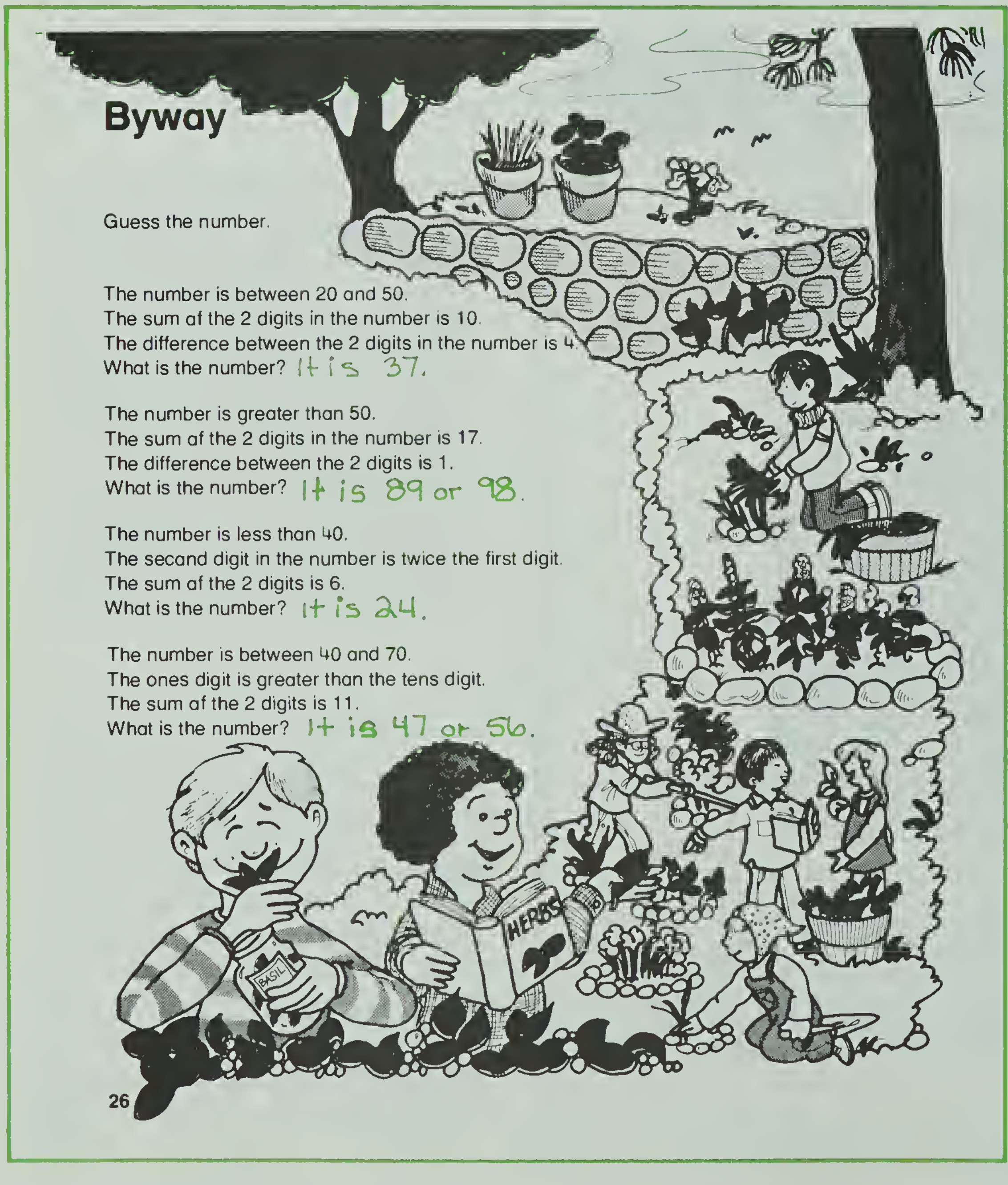
Have about five children take the clue cards they have prepared to an activity centre. A child reads the clues on one of the cards.

The first group member to guess the number reads the clues on another card and so on.



HERBS
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Byway

Guess the number.

The number is between 20 and 50.
The sum of the 2 digits in the number is 10.
The difference between the 2 digits in the number is 4.
What is the number? It is 37.

The number is greater than 50.
The sum of the 2 digits in the number is 17.
The difference between the 2 digits is 1.
What is the number? It is 89 or 98.

The number is less than 40.
The second digit in the number is twice the first digit.
The sum of the 2 digits is 6.
What is the number? It is 24.

The number is between 40 and 70.
The ones digit is greater than the tens digit.
The sum of the 2 digits is 11.
What is the number? It is 47 or 56.

26

Unit 1 Section 2 Lesson 6

Discovering Addition and Subtraction Facts of 11 and 12

Materials

- beans, one side spray painted
- chart paper
- blank cards
- for each child
  - Fact Finder, reproduced from Program Master 15
  - 12 counters

Lesson

1

Seat the children around the working area. Give each child 11 counters and a Fact Finder. Have the children discover and record the fact families of 11. For example

4 + 7 = 11   *11 − 7 = 4*
7 + 4 = 11   *11 − 4 = 7*

2

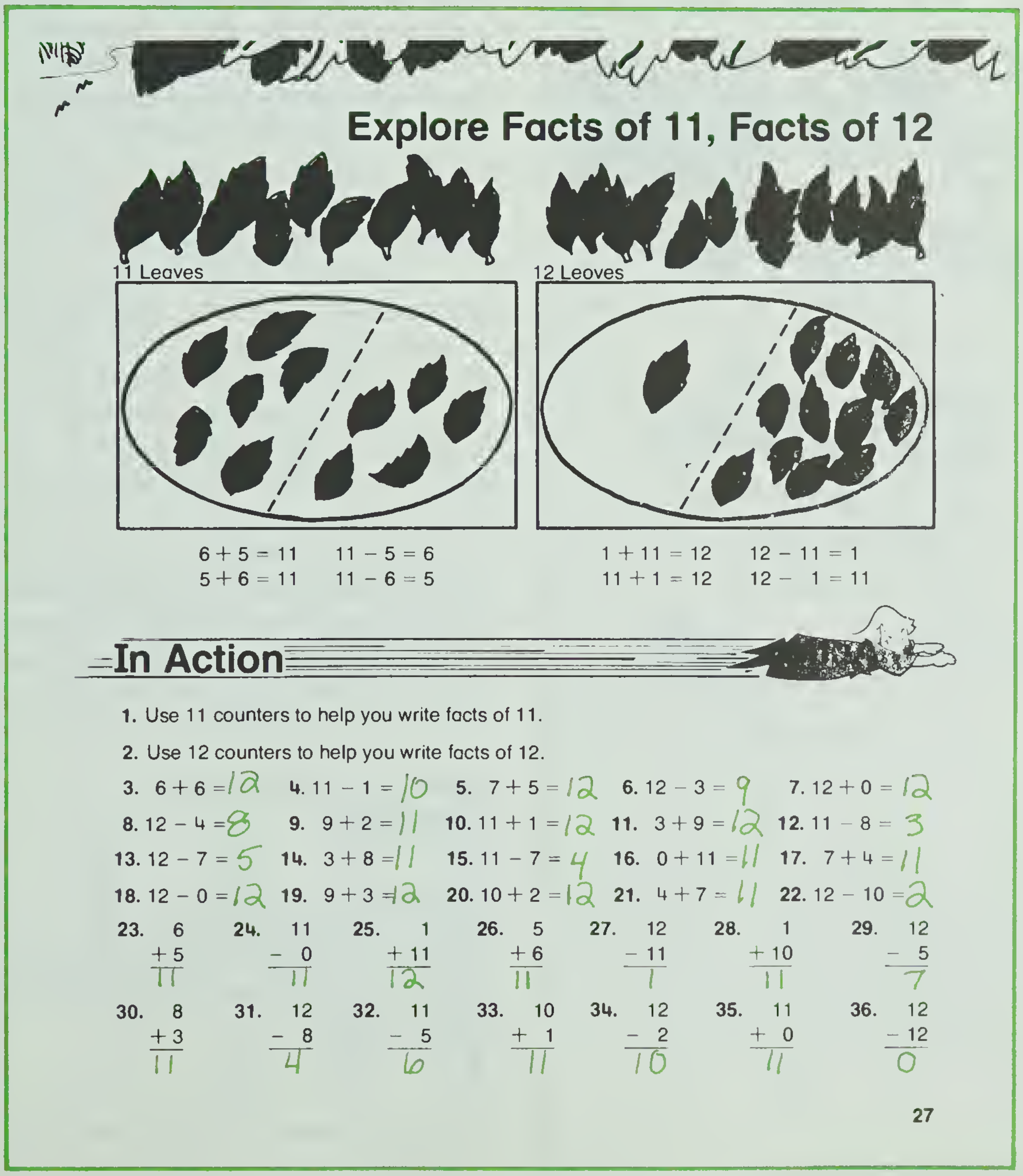
Give each child 12 counters and repeat step 1 for the related addition and subtraction facts of 12.

3

Pose word problems such as

Brian collected eight leaves and Susie collected four leaves.
How many leaves did they collect altogether?
Martha found 11 kinds of leaves and gave three away.
How many did she have left?
Chris filled 12 pages in a leaf collection and Sandy filled zero pages.
How many more pages did Chris fill than Sandy?

For each problem have the children write the appropriate number sentence. Write the number sentence on the easel so that the children can check their sentences.



Explore Facts of 11, Facts of 12

11 Leaves   12 Leaves

6 + 5 = 11   11 − 5 = 6
5 + 6 = 11   11 − 6 = 5

1 + 11 = 12   12 − 11 = 1
11 + 1 = 12   12 − 1 = 11

In Action

1. Use 11 counters to help you write facts of 11.
2. Use 12 counters to help you write facts of 12.

3. 6 + 6 = 12 4. 11 − 1 = 10 5. 7 + 5 = 12 6. 12 − 3 = 9 7. 12 + 0 = 12
8. 12 − 4 = 8 9. 9 + 2 = 11 10. 11 + 1 = 12 11. 3 + 9 = 12 12. 11 − 8 = 3
13. 12 − 7 = 5 14. 3 + 8 = 11 15. 11 − 7 = 4 16. 0 + 11 = 11 17. 7 + 4 = 11
18. 12 − 0 = 12 19. 9 + 3 = 12 20. 10 + 2 = 12 21. 4 + 7 = 11 22. 12 − 10 = 2

23. $\begin{array}{r} 6 \\ +5 \\ \hline 11 \end{array}$ 24. $\begin{array}{r} 11 \\ -0 \\ \hline 11 \end{array}$ 25. $\begin{array}{r} 1 \\ +11 \\ \hline 12 \end{array}$ 26. $\begin{array}{r} 5 \\ +6 \\ \hline 11 \end{array}$ 27. $\begin{array}{r} 12 \\ -11 \\ \hline 1 \end{array}$ 28. $\begin{array}{r} 1 \\ +10 \\ \hline 11 \end{array}$ 29. $\begin{array}{r} 12 \\ -5 \\ \hline 7 \end{array}$

30. $\begin{array}{r} 8 \\ +3 \\ \hline 11 \end{array}$ 31. $\begin{array}{r} 12 \\ -8 \\ \hline 4 \end{array}$ 32. $\begin{array}{r} 11 \\ -5 \\ \hline 6 \end{array}$ 33. $\begin{array}{r} 10 \\ +1 \\ \hline 11 \end{array}$ 34. $\begin{array}{r} 12 \\ -2 \\ \hline 10 \end{array}$ 35. $\begin{array}{r} 11 \\ +0 \\ \hline 11 \end{array}$ 36. $\begin{array}{r} 12 \\ -12 \\ \hline 0 \end{array}$

27

2

Tell the children to think of addition word problems for which the answer is 11 or 12 and subtraction word problems for which the first number in the subtraction is 11 or 12. Have a few children state their word problems. For each problem stated, have the children write the number sentence. Have one child write the sentence on the easel. Discuss how the children know whether the word problem requires addition or subtraction: addition problems involve joining things together, while subtraction problems involve comparing the numbers in sets or finding the difference between the numbers in two sets.

Written and Other Activities

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mathways 3, page 27

Each child will need 12 counters and a Fact Finder for questions 1 and 2.

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Have each child write word problems that use facts of 11 or facts of 12, record the number sentence used to find the answer, and then write a concluding statement for the problem. They could write several problems and then compare addition and subtraction problems.

☐ ☐ ☐

Use the painted beans made for children's text page 11. Children can toss 12 beans and record the results on a chart as shown to obtain addition facts of 12.

Painted side	Unpainted side	Addition sentence
3	9	3+9=12
4	8	4+8=12
7	5	7+5=12

Repeat the above activity with 11 beans for the addition facts of 11.

Unit 1 Section 2 Lesson 7

Exploring Facts of 13 and 14

Materials

- numeral cards, three sets of 0 to 14
- for each child
  - Fact Finder
  - 14 counters
  - copy of chart reproduced from Program Master 21
- for groups of five
  - chart paper
  - marker

Lesson

1

Seat the children around the working area. Distribute Fact Finders and counters. Instruct the children as follows:

Put seven counters in one section of your Fact Finder and six counters in the other.

What addition sentence can we write?
Have the child who responds record on the easel while the others record on paper
7 + 6 = 13
What other addition sentence can we write?
Have the children record
6 + 7 = 13
What two subtraction sentences can we write to complete this fact family?
Have the children who respond record on the easel while the others record on paper
13 − 6 = 7   *13 − 7 = 6*

Invite children to show other facts of 13 on their Fact Finders and write fact families on the easel. Continue until all the facts have been discovered.

2

Repeat step 1 for developing facts of 14.

3

Divide the class into groups of five. Appoint a recorder in each group and give each a sheet of chart paper and a marker. Write 6+7=13 and 7+6=13 on the easel and tell the children that these are addition facts of 13. Then the members of each group tell their recorder as many addition facts of 13 as possible in three minutes and he or she records them.
Observe the groups and help them if there is confusion about what is meant by an addition fact of 13 or how to manage this activity. The group with the most number facts is the winner.
Repeat this activity for the subtraction facts of 13, the addition facts of 14 and the subtraction facts of 14.
Display the sheets of chart paper and discuss the number sentences.

4

Make up word problems, using facts of 13 and 14. For example
Jim got six books for Christmas and seven for his birthday. How many books did Jim get altogether?
Jim gave seven books to his sister. How many did he have left?
Have children record the appropriate number sentences on the easel and on paper. Invite group members to make up and record similar word problems for the others to solve.

Written and Other Activities

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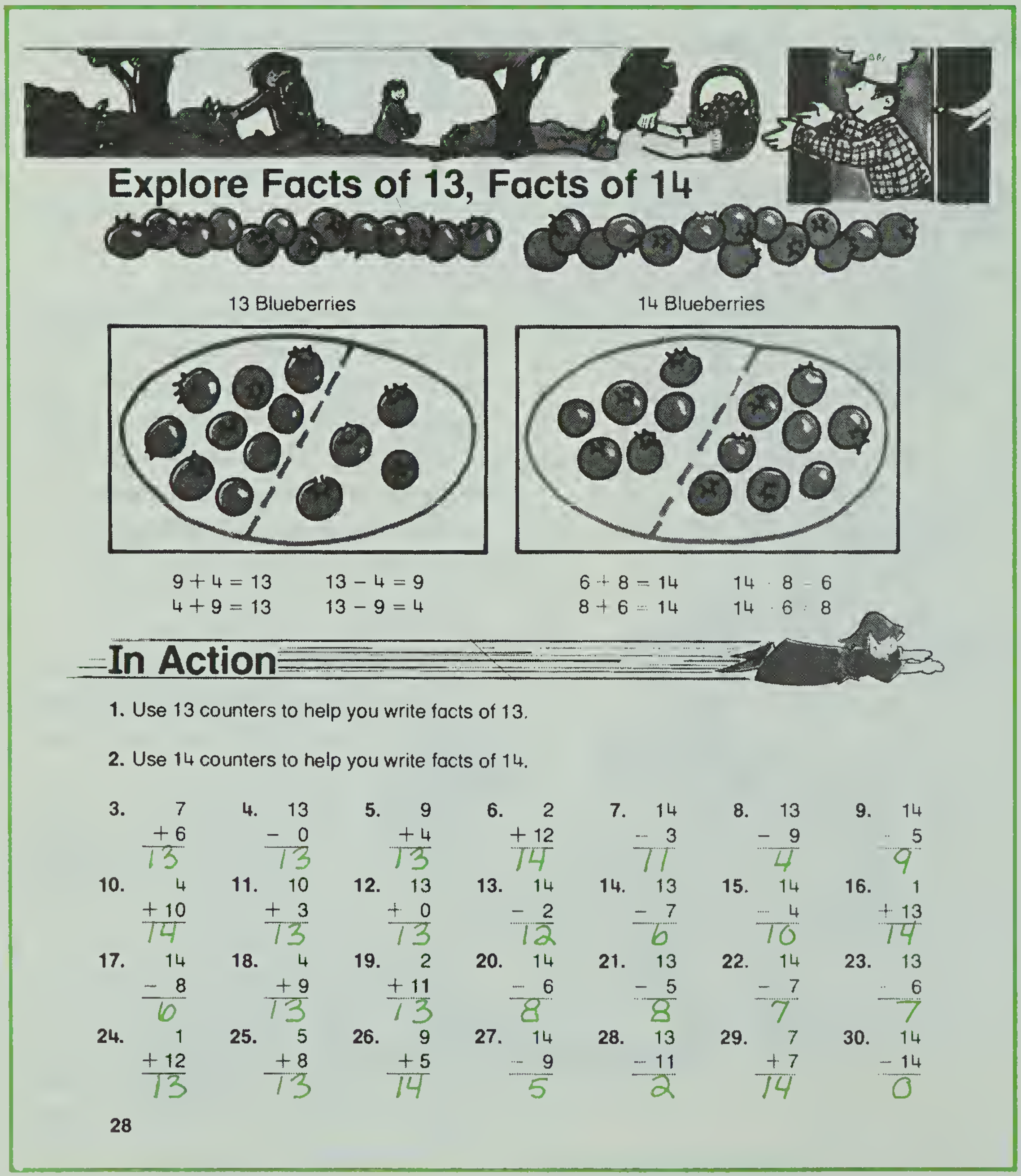
mathways 3, page 28
Discuss the examples shown and distribute Fact Finders. Have children describe how they will complete the In Action exercise.



Explore Facts of 13, Facts of 14

13 Blueberries

9 + 4 = 13   13 − 4 = 9
4 + 9 = 13   13 − 9 = 4

14 Blueberries

6 + 8 = 14   14 − 8 = 6
8 + 6 = 14   14 − 6 = 8

In Action

1. Use 13 counters to help you write facts of 13.
2. Use 14 counters to help you write facts of 14.

3. $\begin{array}{r} 7 \\ +6 \\ \hline 13 \end{array}$
4. $\begin{array}{r} 13 \\ -0 \\ \hline 13 \end{array}$
5. $\begin{array}{r} 9 \\ +4 \\ \hline 13 \end{array}$
6. $\begin{array}{r} 2 \\ +12 \\ \hline 14 \end{array}$
7. $\begin{array}{r} 14 \\ -3 \\ \hline 11 \end{array}$
8. $\begin{array}{r} 13 \\ -9 \\ \hline 4 \end{array}$
9. $\begin{array}{r} 14 \\ -5 \\ \hline 9 \end{array}$
10. $\begin{array}{r} 4 \\ +10 \\ \hline 14 \end{array}$
11. $\begin{array}{r} 10 \\ +3 \\ \hline 13 \end{array}$
12. $\begin{array}{r} 13 \\ +0 \\ \hline 13 \end{array}$
13. $\begin{array}{r} 14 \\ -2 \\ \hline 12 \end{array}$
14. $\begin{array}{r} 13 \\ -7 \\ \hline 6 \end{array}$
15. $\begin{array}{r} 14 \\ -4 \\ \hline 10 \end{array}$
16. $\begin{array}{r} 1 \\ +13 \\ \hline 14 \end{array}$
17. $\begin{array}{r} 14 \\ -8 \\ \hline 6 \end{array}$
18. $\begin{array}{r} 4 \\ +9 \\ \hline 13 \end{array}$
19. $\begin{array}{r} 2 \\ +11 \\ \hline 13 \end{array}$
20. $\begin{array}{r} 14 \\ -6 \\ \hline 8 \end{array}$
21. $\begin{array}{r} 13 \\ -5 \\ \hline 8 \end{array}$
22. $\begin{array}{r} 14 \\ -7 \\ \hline 7 \end{array}$
23. $\begin{array}{r} 13 \\ -6 \\ \hline 7 \end{array}$
24. $\begin{array}{r} 1 \\ +12 \\ \hline 13 \end{array}$
25. $\begin{array}{r} 5 \\ +8 \\ \hline 13 \end{array}$
26. $\begin{array}{r} 9 \\ +5 \\ \hline 14 \end{array}$
27. $\begin{array}{r} 14 \\ -9 \\ \hline 5 \end{array}$
28. $\begin{array}{r} 13 \\ -11 \\ \hline 2 \end{array}$
29. $\begin{array}{r} 7 \\ +7 \\ \hline 14 \end{array}$
30. $\begin{array}{r} 14 \\ -14 \\ \hline 0 \end{array}$

28

☐ ☐

Have the children record the addition and subtraction facts of 13 and 14 in their notebooks.

$13 + 0 = 13$ $13 - 0 = 13$
$12 + 1 = 13$ $13 - 1 = 12$
$11 + 2 = 13$ $13 - 2 = 11$
$10 + 3 = 13$ $13 - 3 = 10$
$9 + 4 = 13$ $13 - 4 = 9$
$8 + 5 = 13$ $13 - 5 = 8$
$7 + 6 = 13$ $13 - 6 = 7$
$6 + 7 = 13$ $13 - 7 = 6$
$5 + 8 = 13$ $13 - 8 = 5$
$4 + 9 = 13$ $13 - 9 = 4$
$3 + 10 = 13$ $13 - 10 = 3$
$2 + 11 = 13$ $13 - 11 = 2$
$1 + 12 = 13$ $13 - 12 = 1$
$0 + 13 = 13$ $13 - 13 = 0$

$14 + 0 = 14$ $14 - 0 = 14$
$13 + 1 = 14$ $14 - 1 = 13$
$12 + 2 = 14$ $14 - 2 = 12$
$11 + 3 = 14$ $14 - 3 = 11$
$10 + 4 = 14$ $14 - 4 = 10$
$9 + 5 = 14$ $14 - 5 = 9$
$8 + 6 = 14$ $14 - 6 = 8$
$7 + 7 = 14$ $14 - 7 = 7$
$6 + 8 = 14$ $14 - 8 = 6$
$5 + 9 = 14$ $14 - 9 = 5$
$4 + 10 = 14$ $14 - 10 = 4$
$3 + 11 = 14$ $14 - 11 = 3$
$2 + 12 = 14$ $14 - 12 = 2$
$1 + 13 = 14$ $14 - 13 = 1$
$0 + 14 = 14$ $14 - 14 = 0$

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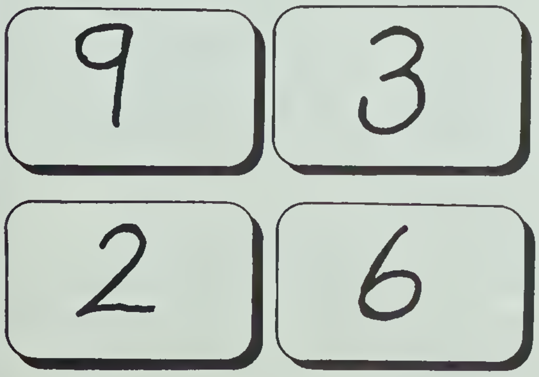
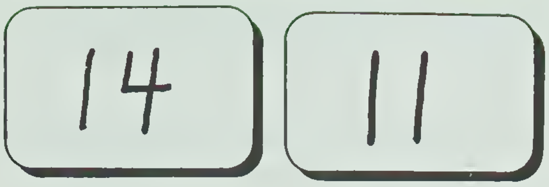
Make three cards for each numeral from 0 to 14 for a game with four players. The dealer shuffles the cards and deals six cards to each player. Each player finds pairs of numeral cards having a difference of 3.





For the cards shown, there are three pairs with a difference of 3:
6 and 3, 9 and 6, 14 and 11. A card can be used more than once. In this hand the 6 is used twice.
Each player receives a point for each pair. The player who has the most points after seven deals is the winner.

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Have the children make cards for addition and subtraction facts to 14 for the game *Concentration.*

☐ ☐ ☐ ☐ ☐

Prepare an easel chart like the one illustrated below. Distribute copies of Program Master 21. Have the children copy the numerals from the easel chart. Addition and subtraction are needed to complete the chart.

+			3	1		5	6		
2						7			
0	2	0							
			6						
						11			
							7		
4				5	8			4	9
		5							
							10		
				4					

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mathways 3 Tests 1A, 1B

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mathways 3 Plus Workbook page 7

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mathways 3 Practice Masters page 5

For Your Notes

Unit 1 Section 2 Lesson 8

Counting by Twos, Threes, Fours and Fives

Materials

- One Hundred Board and numeral tags
- for each child
  - five copies of Program Master 22
  - copy of stencil, *see* ☐ ☐ ☐ ☐

Rationale

Counting by twos, threes, fours and fives prepares the children for multiplication. Frequent counting activities make them familiar with the multiples of two, three, four and five. These activities reinforce number order and patterns, which can be seen on the One Hundred Board. Provide frequent, brief opportunities for the children to count forward and back, with one child counting about 10 numbers, the next child another sequence of 10 and so on. Alternatively, have each child say one number in the sequence. Counting activities of this kind can be used by small groups of children who have completed their seat work early: they can be part of the lesson presented to the whole class, or they can be used with one or more mathematics groups. Such activities are ideal for warming up just after the children enter the classroom or when they are getting ready for recess.

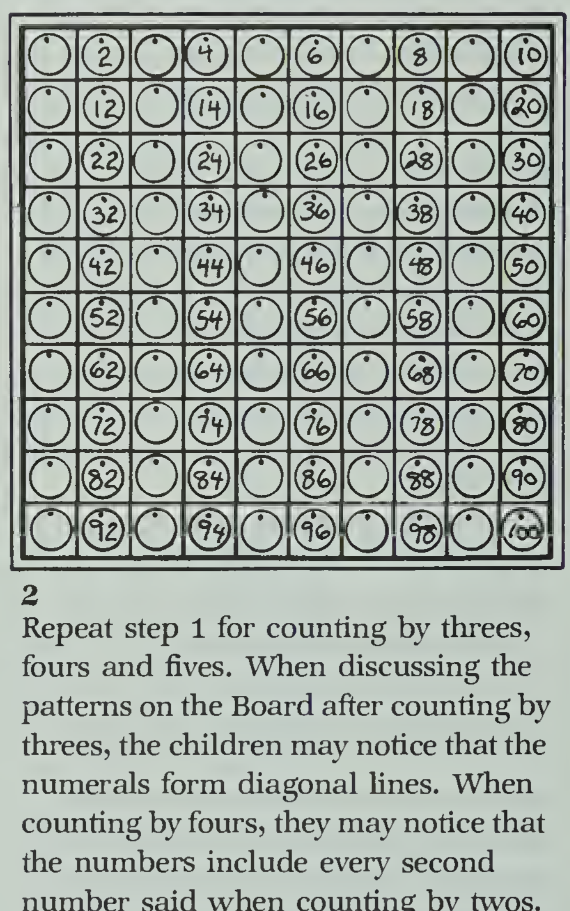
Lesson

1

Seat the children around the One Hundred Board, on which the numeral tags have been hung face up. Have the children take turns counting by twos to 100 as one child turns the uncounted tags face down on the Board. Then, referring to the tags that are face up, ask

What do you notice about the numbers that you say when you are counting by twos?

Children may mention that the numbers are all even, that they are in every second column on the Board or that the digits in the ones place are always 2, 4, 6, 8 or 0.



2

Repeat step 1 for counting by threes, fours and fives. When discussing the patterns on the Board after counting by threes, the children may notice that the numerals form diagonal lines. When counting by fours, they may notice that the numbers include every second number said when counting by twos. When counting by fives, they may see on the Board that the second digit of each number is 5 or 0, and that the numerals form two columns.

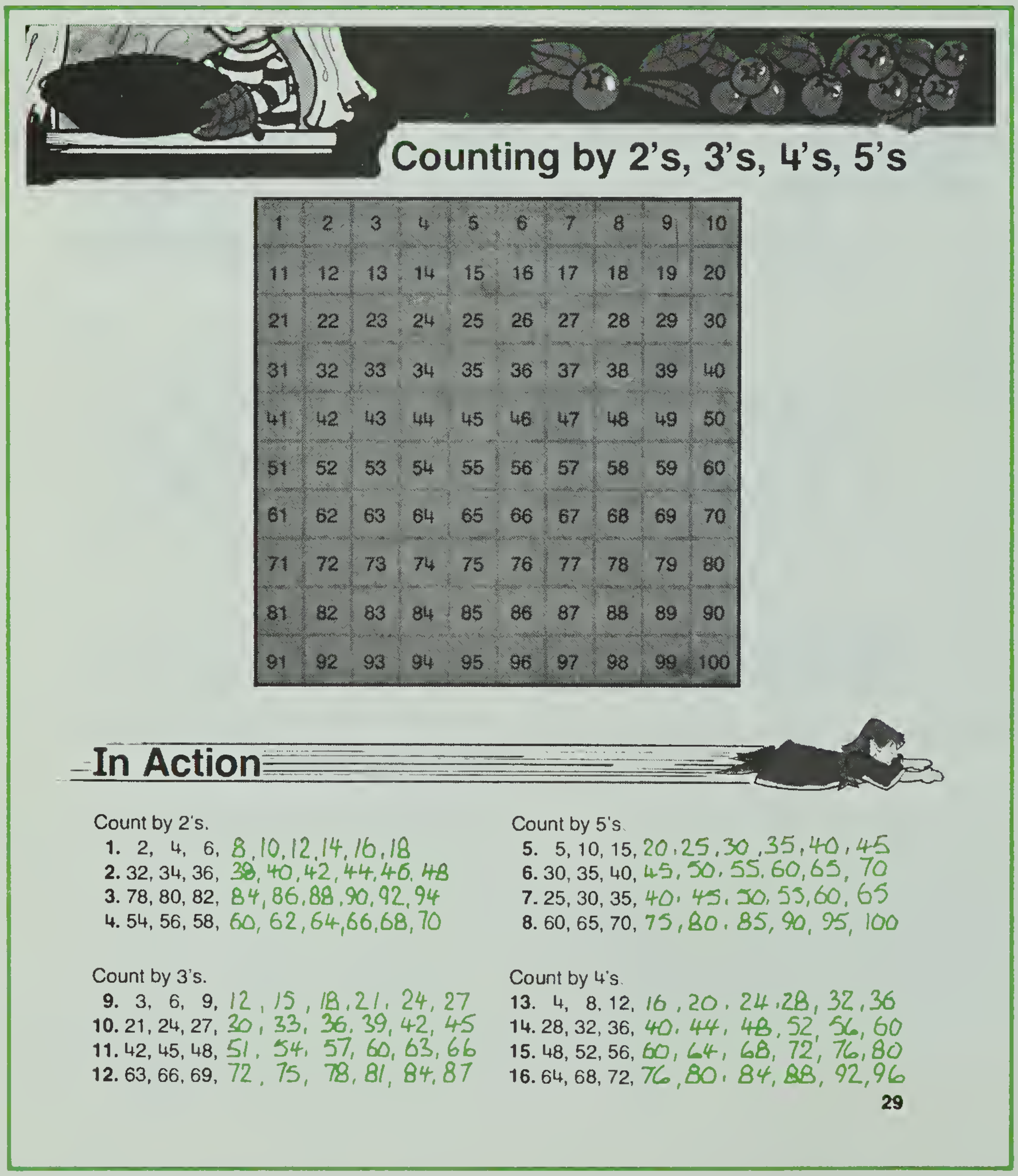
3

Leave the One Hundred Board on display for reference if necessary. Give instructions such as the following, allowing each child to count about six numbers:

Begin at 15 and count by threes.

Begin at 35 and count back by fives.

Each number given to start the count is a multiple of the number they are counting by.



Counting by 2's, 3's, 4's, 5's

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

In Action

Count by 2's.
1. 2, 4, 6, 8, 10, 12, 14, 16, 18
2. 32, 34, 36, 38, 40, 42, 44, 46. 48
3. 78, 80, 82, 84, 86.88, 90, 92, 94
4. 54, 56, 58, 60, 62, 64, 66, 68, 70

Count by 3's.
9. 3, 6, 9, 12, 15, 18, 21, 24, 27
10. 21, 24, 27, 30, 33, 36. 39, 42, 45
11. 42, 45, 48, 51, 54, 57, 60, 63, 66
12. 63, 66, 69, 72, 75, 78, 81, 84, 87

Count by 5's.
5. 5, 10, 15, 20, 25, 30, 35, 40, 45
6. 30, 35, 40, 45, 50, 55. 60, 65, 70
7. 25, 30, 35, 40, 45, 50, 55, 60, 65
8. 60, 65, 70, 75, 80, 85, 90, 95, 100

Count by 4's.
13. 4, 8, 12, 16, 20, 24, 28, 32, 36
14. 28, 32, 36, 40, 44, 48, 52, 56, 60
15. 48, 52, 56, 60, 64, 68, 72, 76, 80
16. 64, 68, 72, 76, 80, 84, 88, 92, 96

29

4
Distribute copies of Program Master 22. Have the children colour the squares representing the numbers used when counting by twos. Have children show their charts and discuss the resulting patterns. Have the children repeat the activity for counting by threes, fours and fives, each time using a new copy of Program Master 22.

Written and Other Activities

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mathways 3, page 29

☐ ☐

Give each child a copy of Program Master 22. Have the children colour the numerals for counting by twos, ring the numerals for counting by threes, draw a box around the numerals for counting by fours and cross out the numerals for counting by fives. This helps them compare the patterns for these multiples.

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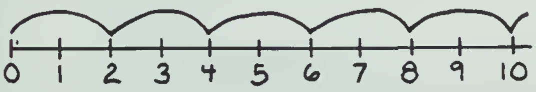
Have the children draw and label number lines from zero to 20. Then tell them to draw arrows to show counting by twos, beginning with zero. Repeat this activity for counting by threes, fours and fives.



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Pupils can complete patterns by deciding what to count by. Make a stencil similar to this.

—, —, —, 10, 12, 14, —, —
—, —, 75, 80, 85, —, —, —
—, —, —, —, —, 88, 92, 96
—, 66, 69, 72, —, —, —, —
—, —, —, —, —, 96, 98, 100
—, —, 20, 24, 28, —, —, —
—, —, —, —, 55, 60, 65, —
9, 12, 15, —, —, —, —, —

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When keeping score for a game, perhaps during gym class, give three points at a time to provide practice in counting by threes. In other games, assign two, four or five points at a time.

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A greater challenge but a most worthwhile one is having the children count by threes – but asking them to begin at a non-multiple of 3. This activity can also be used for counting by twos, fours and fives. A slow start is most essential. It is usually crucial too for the children to have access to either the Hundred Board or their own hundred chart which they have completed.

☐ ☐ ☐ ☐ ☐ ☐ ☐

Have the children count back from 100 by twos, threes, fours and fives.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 8

For Your Notes

Unit 1 Section 3 Lesson 1

Telling Time: The Hour

Materials

- model clock
- various kinds of clocks
- for each group
  - magazines
  - glue
  - pair of scissors
  - construction paper
- for each child
  - model clock
  - copy of Program Master 25

Rationale

After lessons on time are taught, frequent references to the time of day, time intervals, earlier times and later times should be made. Children should often be asked to state the time and show times on a model clock face.

In developing concepts of time, the *mathways* series avoids the terms *half hour, quarter past* the hour, and *quarter to* the hour. These terms often present difficulties for children. It is easier to read and write times, using five-minute and one-minute intervals. Also, this practice prepares children for digital clocks and for 24 h time.

Every household seems to have at least one alarm-type clock no longer in working order. A letter home explaining the advantages of using realistic equipment and requesting non-working clocks usually brings excellent results. Each child can then have a real-life model to work with.

Lesson

1

Gather the children around the working area. Show the time eight o'clock on the model clock. Have a child point to the hour hand and the minute hand. Ask

Which is longer, the hour hand or the minute hand?

What numeral does the hour hand point to?

What numeral does the minute hand point to?

What time is it?

What do you do at eight o'clock in the morning?

What do you do at eight o'clock at night?

Write *8 o'clock* and *8:00* on the easel and explain that 8:00 means eight hours and zero minutes. Repeat this activity for a few hour times.

2

Distribute old clocks. Write *6 o'clock* on the easel and ask a child to write the time in another way.

Show the time on your clock.

Repeat this activity for each of the hours from 1 o'clock to 12 o'clock.

Written and Other Activities

☐

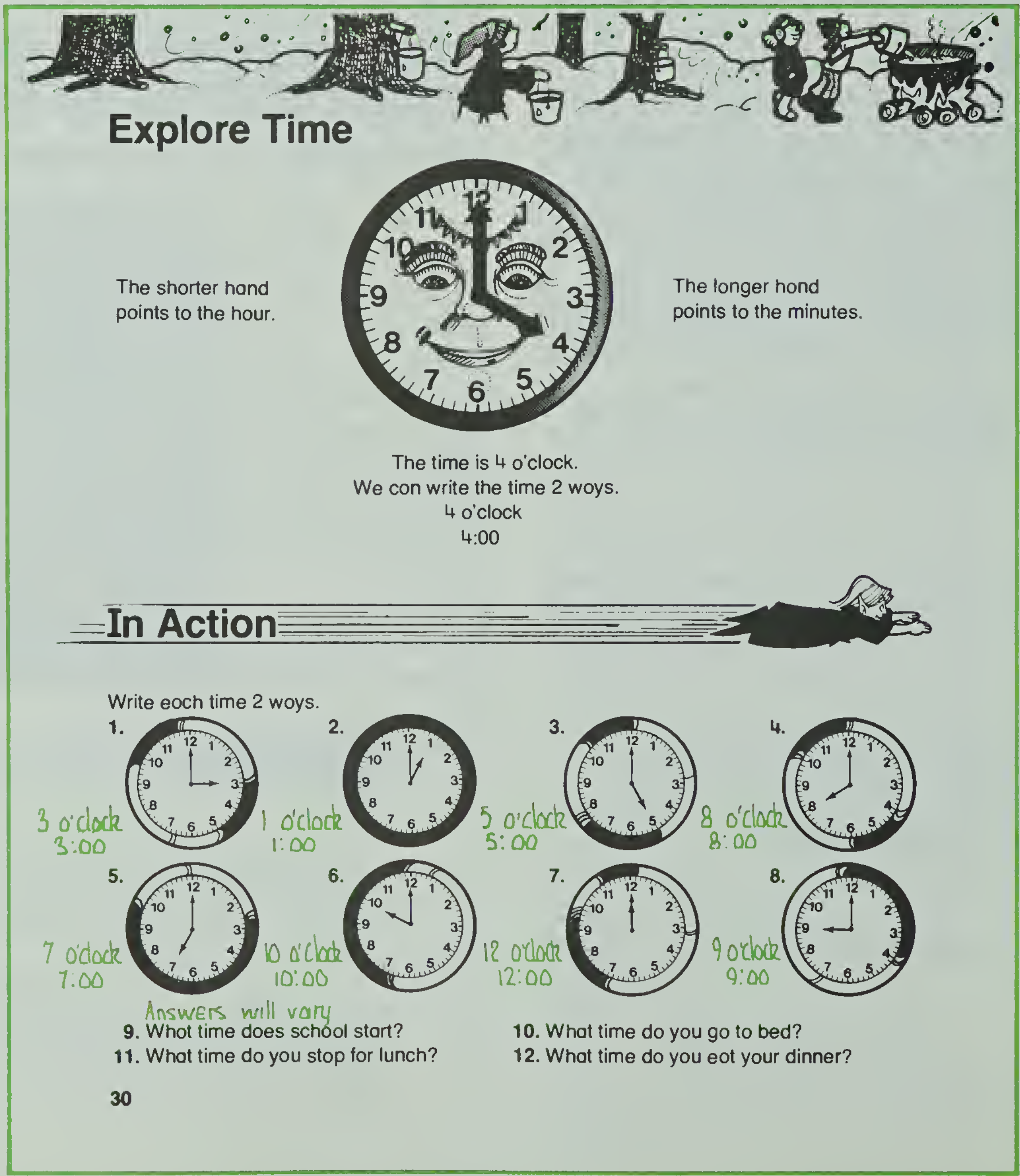
mathways 3, page 30

☐ ☐

Give each child a copy of Program Master 25. On the easel write the numerals from 1 to 12 to correspond to the 12 clock faces on the Program Master. Beside each numeral write an hour interval. Have the children show those times on their copy of the Master.

☐ ☐ ☐

The children can learn about ways of telling time besides dial clocks. They may find past methods, such as sundials and hour glasses, interesting. Children may also want to know about digital clocks, 24 h clocks and egg timers. Groups of children can research information about various kinds of clocks and tell the class or cut pictures from magazines to make a clock display.



Explore Time

The shorter hand points to the hour.

The longer hand points to the minutes.

The time is 4 o'clock.
We can write the time 2 ways.
4 o'clock
4:00

In Action

Write each time 2 ways.

1. 3 o'clock 3:00
2. 1 o'clock 1:00
3. 5 o'clock 5:00
4. 8 o'clock 8:00
5. 7 o'clock 7:00
6. 10 o'clock 10:00
7. 12 o'clock 12:00
8. 9 o'clock 9:00

Answers will vary

9. What time does school start?
10. What time do you go to bed?
11. What time do you stop for lunch?
12. What time do you eat your dinner?

30

Unit 1 Section 3 Lesson 2

Telling Time: Five-Minute Intervals

Materials

- model clock face
- for each child
  - copy of Program Master 25
  - old clock or cardboard model

Lesson

1

Seat the children around the working area. Show one o'clock on the model clock.

What numeral does the hour hand point to?

What numeral does the minute hand point to?

What time is it?

Write 1:00 on the easel.

How long does it take for the hour hand to go from one numeral to the next?

How long does it take for the minute hand to go from one numeral to the next?

2

Show the time 1:05 on the clock.

What numeral has the hour hand just passed?

Emphasize that the hour hand does not point exactly to the one, but has just passed it.

What numeral does the minute hand point to?

What time is it?

Write 1:05 on the easel. Repeat this activity for 1:10, 1:15, 1:20, . . ., 2:00.

3

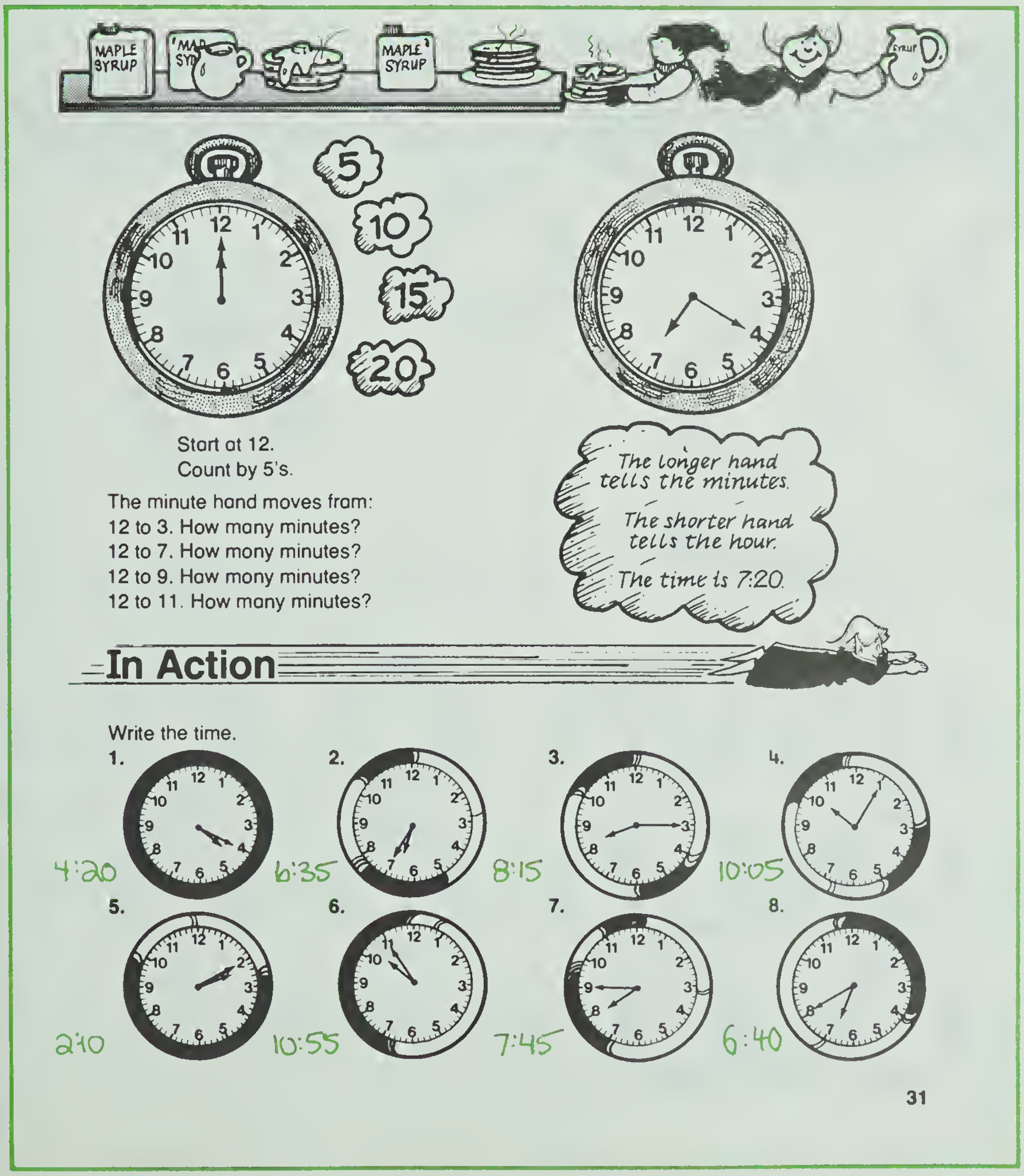
Show 11:55 on the clock. Have the children count by fives to identify the time. Repeat for several different times.

4

Distribute the old clocks or models. Write 3:40 on the easel and tell the children to show the time on their model or real clocks. Have the children count the five-minute intervals between the hour and minute hands by fives. Repeat this, using other hours plus five-minute intervals.

5

Give children practice by relating activities and times. Have one child name an activity and another state the time for the activity; or one child says a time and another names an activity for the time. The children show each time on their clocks. This activity can be for the class, a small group of children, or two children.



Start at 12.
Count by 5's.

The minute hand moves from:
12 to 3. How many minutes?
12 to 7. How many minutes?
12 to 9. How many minutes?
12 to 11. How many minutes?

The longer hand tells the minutes.
The shorter hand tells the hour.
The time is 7:20.

In Action

Write the time.

1. 4:20
2. 6:35
3. 8:15
4. 10:05
5. 2:10
6. 10:55
7. 7:45
8. 6:40

31

Written and Other Activities

☐

mathways 3, page 31

Discuss the questions on the page and then assign the In Action exercise.

☐ ☐

The children can show different times on copies of Program Master 25. On the easel write numerals from 1 to 12 to correspond to the 12 clock faces on the Program Master. Beside each write a time involving a 5 min interval. Have the children show those times on their copy of the Master. Remind them that when the minute hand does not point at 12, the hour hand does not point exactly at a numeral.

Unit 1 Section 3 Lesson 3

Writing Hour plus Five-Minute Intervals

Materials

- model clock face

Lesson

1

Gather the children around the working area. Show the time 4:20 on the model clock. Have a child write the time on the easel.

Read the first numeral.

Read the second numeral.

Explain that the time can also be written in words. Write *four twenty* on the easel. Repeat this for several other times. Include times such as *3:05, three-O-five.* Then invite children to show times on the model, and record the times in two ways on the easel.

2

Say times, such as 6:05 and 7:20, and have the children record them in their notebooks in two ways. Have them illustrate each time by drawing a clock face.

Written and Other Activities

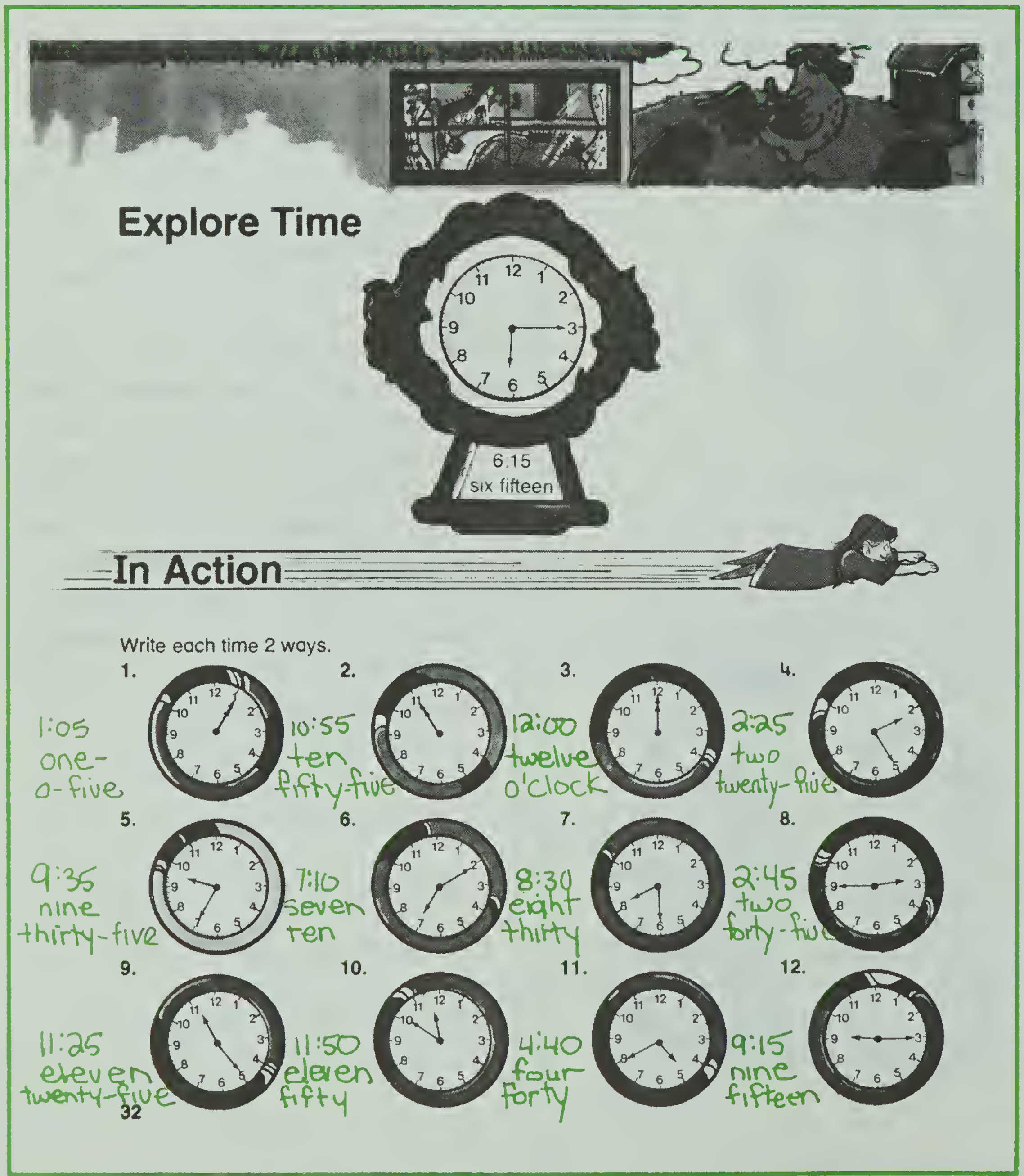
☐

mathways 3, page 32

☐ ☐

Children can make a schedule for a day showing the time for beginning and ending each activity. The schedule could be the plan for the next day or a diary of the last day. The schedules can also be used for calculating the amount of time for each activity.

For Your Notes



Explore Time

6:15
six fifteen

In Action

Write each time 2 ways.

1. 1:05 one-o-five
2. 10:55 ten fifty-five
3. 12:00 twelve o'clock
4. 2:25 two twenty-five
5. 9:35 nine thirty-five
6. 7:10 seven ten
7. 8:30 eight thirty
8. 2:45 two forty-five
9. 11:25 eleven twenty-five
10. 11:50 eleven fifty
11. 4:40 four forty
12. 9:15 nine fifteen

32

Unit 1 Section 3 Lesson 4

Exploring Time: Earlier and Later

Materials

- model clock face
- for each child
  - – old clock or cardboard model
  - – copy of Program Master 25

Lesson

1

Invite the children into the working area. Distribute the old clocks, giving one to each child. Then, on the model clock, show 2:30. Have each child show that time and record it. Say *Change the hands on your clock to show the time that is five minutes later.*

Have each child change the hands and record the new time beside the old time.

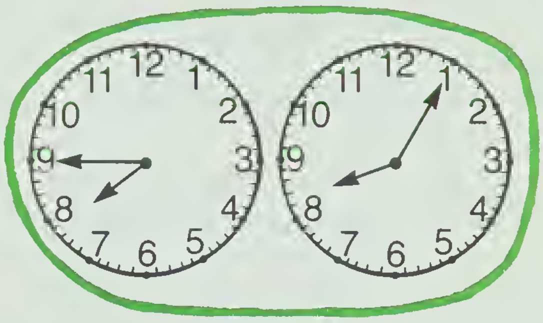
Change the hands on your clock to show the time that is ten minutes earlier.

Discuss how the clock's hands move forward to show times that are later and that they must be moved back to show times that are earlier. This means that minutes are added to show later times and subtracted to show earlier times.

Repeat the activity several times. Include times that require both hands to move. For example, 15 min later than 5:55 is 6:10; 10 min earlier than 9:05 is 8:55.

2

Distribute copies of Program Master 25. Have each child loop together two clocks. On one, the child shows a time and on the other he or she shows a time from 5 to 30 min earlier or later. Have the children display and compare their clocks, and discuss the times shown, using the terms *earlier* and *later*. The children repeat the activity with another pair of clocks.



Twenty minutes earlier than 8:05 is 7:45.
Twenty minutes later than 7:45 is 8:05.

Written and Other Activities

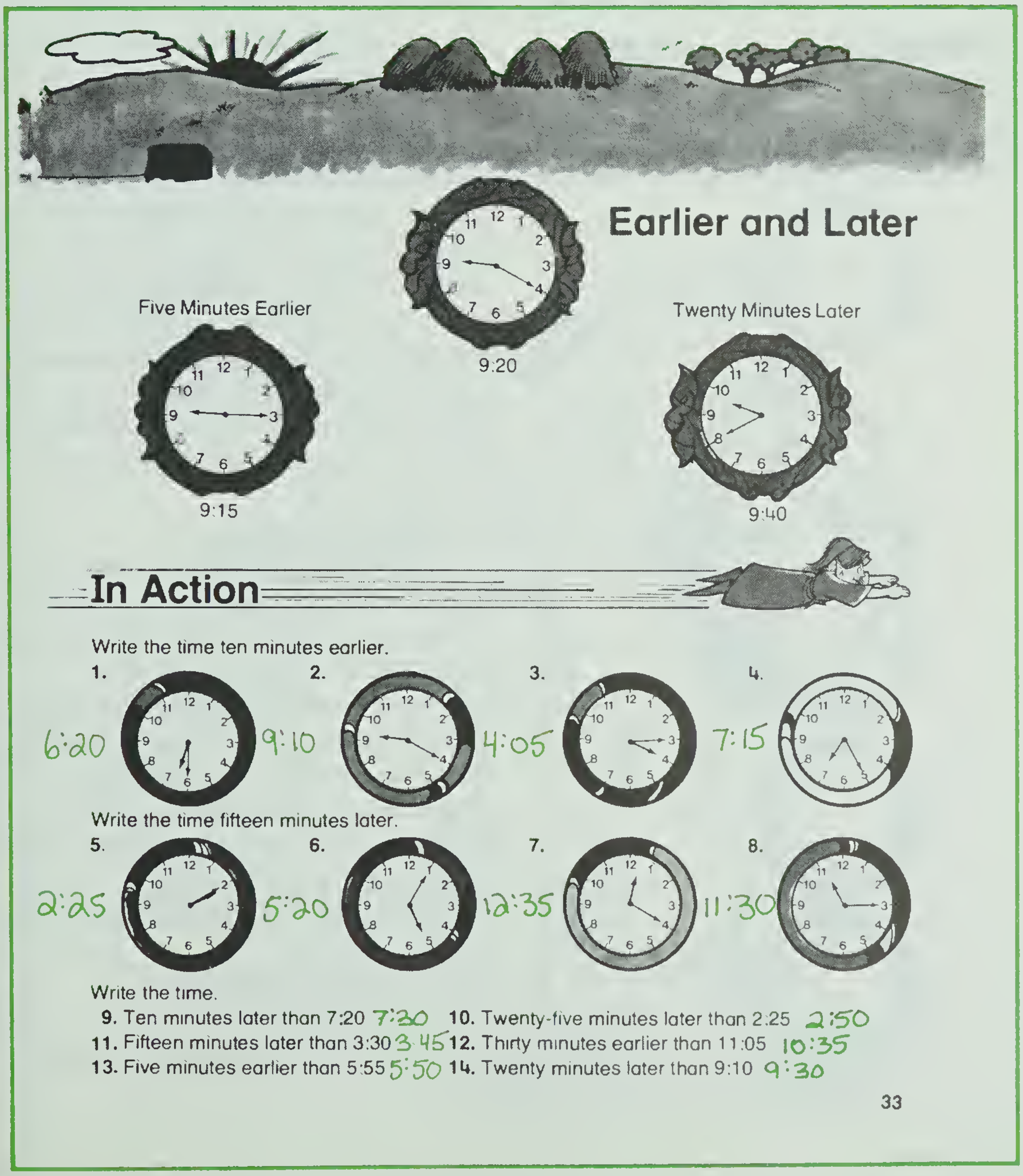
☐

mathways 3, page 33

Have children read the times shown in the example and discuss them before assigning the In Action exercise. Some children may need to use a clock or draw a clock to show the times asked for. Copies of Program Master 25 can be used to help children draw clocks that show earlier and later times.

☐ ☐

Have the children find and cut out of old newspapers T.V. schedules, movie timetables and so on. Have them read the times when the movie starts, when favourite T.V. programs start, and so on.



Earlier and Later

Five Minutes Earlier 9:15

9:20

Twenty Minutes Later 9:40

In Action

Write the time ten minutes earlier.

1. 6:20
2. 9:10
3. 4:05
4. 7:15

Write the time fifteen minutes later.

5. 2:25
6. 5:20
7. 12:35
8. 11:30

Write the time.

9. Ten minutes later than 7:20 7:30
10. Twenty-five minutes later than 2:25 2:50
11. Fifteen minutes later than 3:30 3 45
12. Thirty minutes earlier than 11:05 10:35
13. Five minutes earlier than 5:55 5:50
14. Twenty minutes later than 9:10 9:30

33

Unit 1 Section 3 Lesson 5

Solving Problems Involving Time

Materials

- for each child
  - old clock

Lesson

1

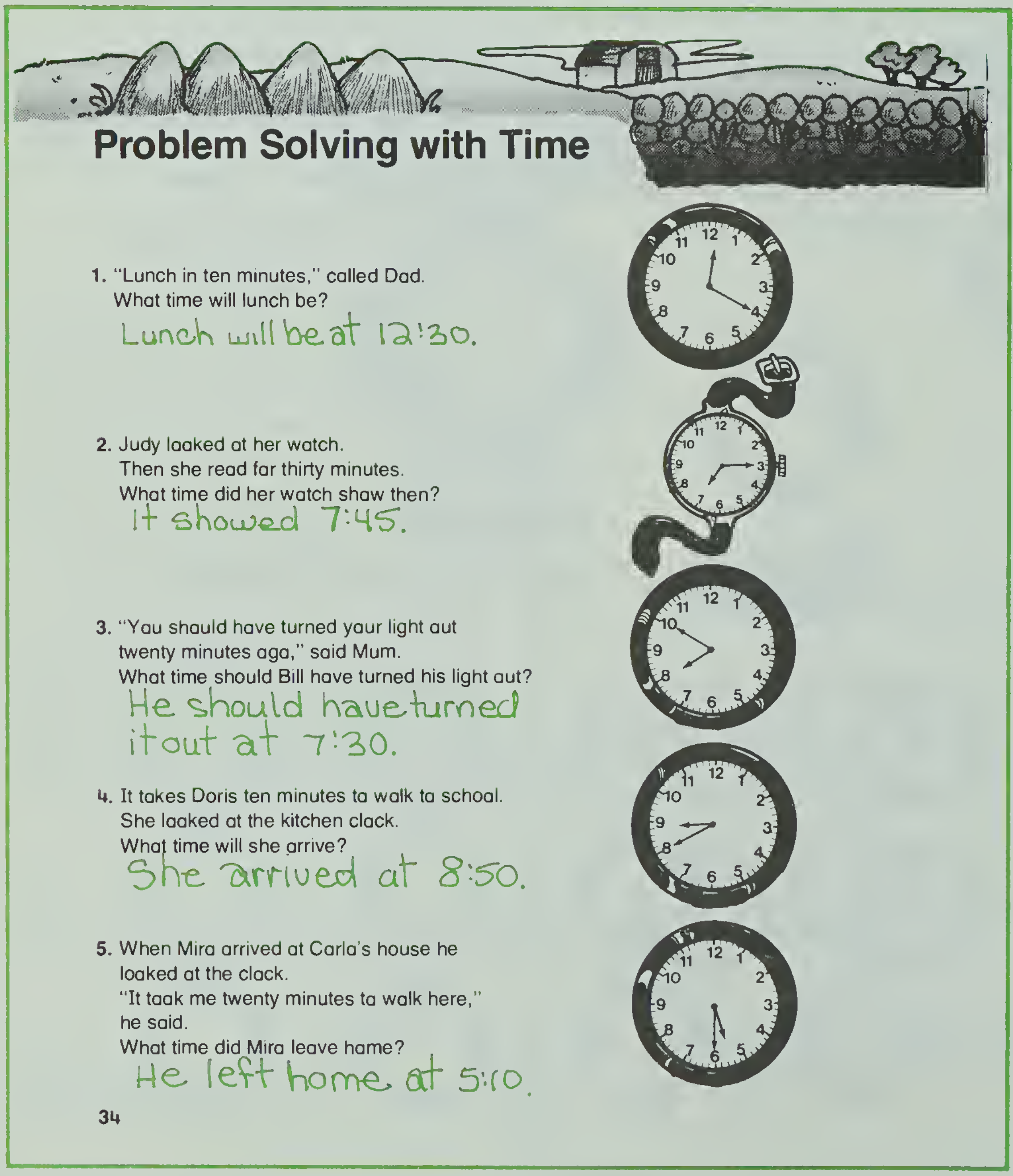
Gather the children into the working area. Write the following word problem on the easel.

Gina arrived in the playground at 3:30.
Tom arrived ten minutes later.
When did Tom arrive?
Read this problem aloud please, Alex.
Tell us the problem in your own words, please, Susan.
What time did Gina arrive at the playground?
Did Tom arrive earlier or later than Gina?
How much later did Tom arrive?
What time is ten minutes later than 3:30?
When did Tom arrive?

Have the child answering the last question answer with a sentence. Change the time in the word problem and ask similar questions. Then change the number of minutes later and ask similar questions. Next change *later* to *earlier* and ask similar questions.

2

Have all the children create and present to the group a problem involving time. To get started, the time at which a child leaves home and the time it takes to walk to school for each child might be exploited. Most children need a lot of experience before becoming proficient at making up problems.



Problem Solving with Time

1. "Lunch in ten minutes," called Dad.
What time will lunch be?
Lunch will be at 12:30.

2. Judy looked at her watch.
Then she read for thirty minutes.
What time did her watch show then?
It showed 7:45.

3. "You should have turned your light out twenty minutes ago," said Mum.
What time should Bill have turned his light out?
He should have turned it out at 7:30.

4. It takes Doris ten minutes to walk to school.
She looked at the kitchen clock.
What time will she arrive?
She arrived at 8:50.

5. When Mira arrived at Carla's house he looked at the clock.
"It took me twenty minutes to walk here," he said.
What time did Mira leave home?
He left home at 5:10.

34

Written and Other Activities

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mathways 3, page 34

Each problem requires the children to decide whether they are asked for an earlier time or a later time. Then the children must determine how many minutes earlier or later the time will be and calculate the new time. This is an extension of the lesson on page 33, for which the children were asked to write an earlier or later time.

If the letter home suggested earlier brought good results, give each child a non-working clock to help solve the problems.

☐ ☐

Children can make up word problems like the ones on page 34 for others to answer. Children can work in pairs, presenting the problems to each other. They can work in small groups in which one child says a word problem and the first group member to answer says the next problem. For this activity, it may be necessary for the children to write a few problems before joining the group.

☐ ☐ ☐

In the problems on page 34, a time and a time interval are given, and the children are asked for the time at the beginning or the end of the time interval. For enrichment, vary the type of word problems so that the children are given two times and asked for the time interval. The teacher or some children can make up the problems for others to solve. For example

The game began at 4:10 and ended at 4:50.
How long did it last?

☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 9 and 10

Unit 1 Section 3 Lesson 6

Byway: Making Clocks

Materials

- plywood
- glue
- compass
- for each child
  - – paper plate
  - – cardboard
  - – crayons
  - – pair of scissors
  - – wing clip
  - – tin cans

Lesson

1

Have the children observe the clock in the classroom. Compare the length of the minute and hour hands. Point out how the numerals are spaced.

Written and Other Activities

☐

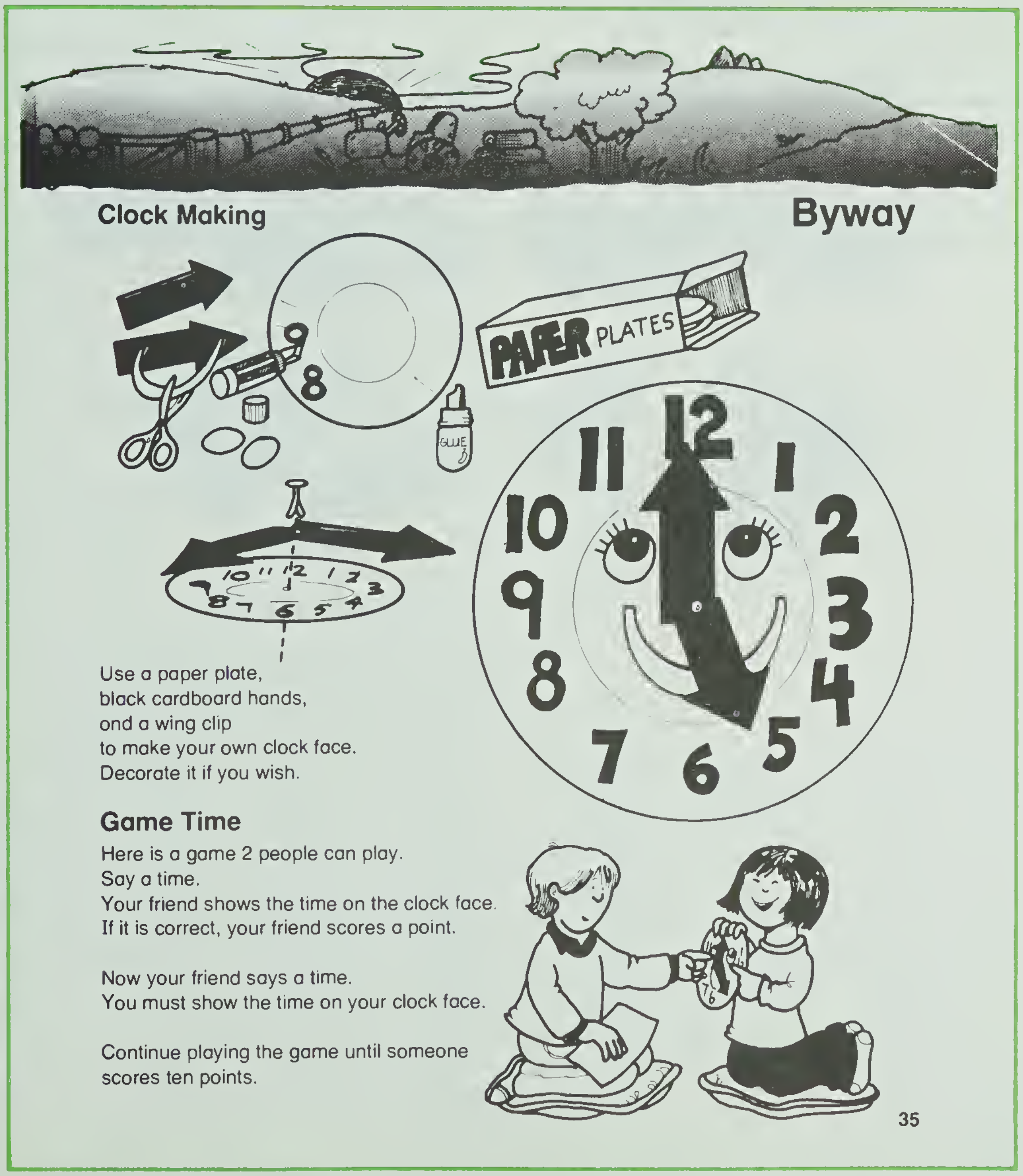
mathways 3, page 35

Some children may require help in spacing the numerals. They may find it easier to write the numerals 12 and 6, then 3 and 9, first. You can provide paper plates with a small rectangular region cut out at the location of each numeral.

Children can take turns using a model.

The children may wish to decorate their clocks.

When the children play the game on page 35, remind them that when the minute hand points to a numeral other than 12, the hour hand does not point exactly at a numeral.



Clock Making

Byway

Use a paper plate,
black cardboard hands,
and a wing clip
to make your own clock face.
Decorate it if you wish.

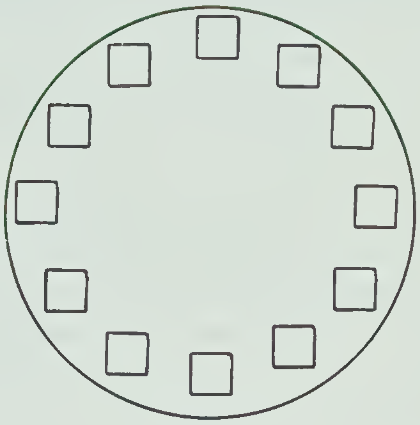
Game Time

Here is a game 2 people can play.
Say a time.
Your friend shows the time on the clock face.
If it is correct, your friend scores a point.

Now your friend says a time.
You must show the time on your clock face.

Continue playing the game until someone scores ten points.

35



☐ ☐

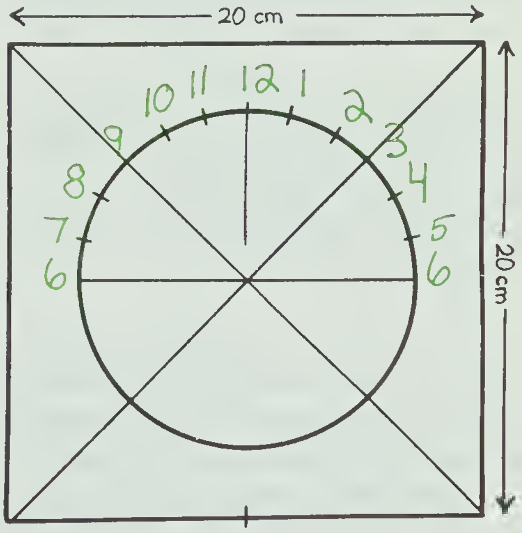
Change the game on page 35 so that a player gives an instruction.

Show the time that is ten minutes earlier than 6:20.

Show the time that is fifteen minutes later than 9:05.

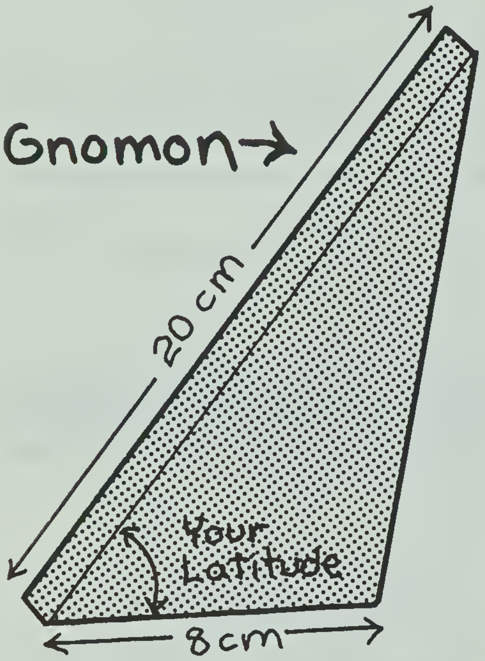
☐ ☐ ☐

Make a sundial for the children to see. Cut a 20 cm square of plywood. Find the centre of the square and inscribe a circle with a diameter of 18 cm. Divide the circle in half. Around the circumference of the top half of the circle mark off 12 equal sections and write a numeral beside each point in this order: 6, 7, 8, 9, 10, 11, 12, 1, 2, 3, 4, 5 and 6.



To make the gnomon – the triangular marker which casts the shadow – you must know the degree of latitude where you live.

On a second piece of wood, draw a line 8 cm long for the base of the gnomon. Draw a 20 cm line to one end of the base to make an angle equal to the degree of latitude where you live. Join the other end of the 20 cm line to the other end of the base. Cut out the gnomon.

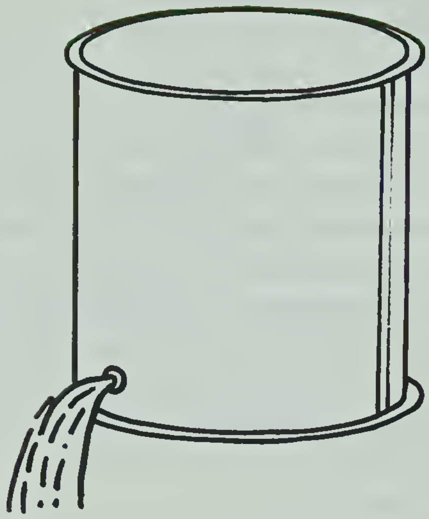


On the dial, draw a line from the number 12 to within 1 cm of the centre. Mount the base of the gnomon on this line, with the angle of latitude toward the centre of the circle. Glue it on.

Select a spot where the sun shines all day and set up your sundial so that the gnomon points due north; use a compass if possible. Now your sundial will tell you the time.

□ □ □ □

Have the children make a personal timing device. A water timer would be one such that would be very possible for grade 3 children. Have a hole punched in the bottom or low on the side of a tin can. Have the can filled with water while the child holds her or his finger over the hole. Have the children time the number of minutes it takes for the water to leak from the can.



The length of time can be varied by increasing the size of the hole. Making a timer for a predetermined length of time – say 10 min – is a task demanding a lot of patience and several tin cans.

Some children might enjoy making a series of timers, each one to time a different period.

□ □ □ □ □

mathways 3 Practice Masters page 6

For Your Notes

Unit 1 Section 4 Lesson 1

Exploring Addition and Subtraction Facts of 15 and 16

Materials

- counters
- for each child
  - – Fact Finder: Program Master 15
  - – 16 counters

Lesson

1

Gather the children around the working area. Give each child a Fact Finder and 15 counters.

Arrange your counters in two groups. Write an addition sentence on the easel to show your arrangement, Fred. If that addition sentence is 7+8=15, then have a child say the family of facts for the addition sentence on the easel. Record them. *The family of facts for 7+8=15 is 8+7=15, 15−8=7 and 15−7=8.* Repeat this activity until all the facts of 15 have been discovered. Include a group of 15 and a group of zero to show 15+0=15.

2

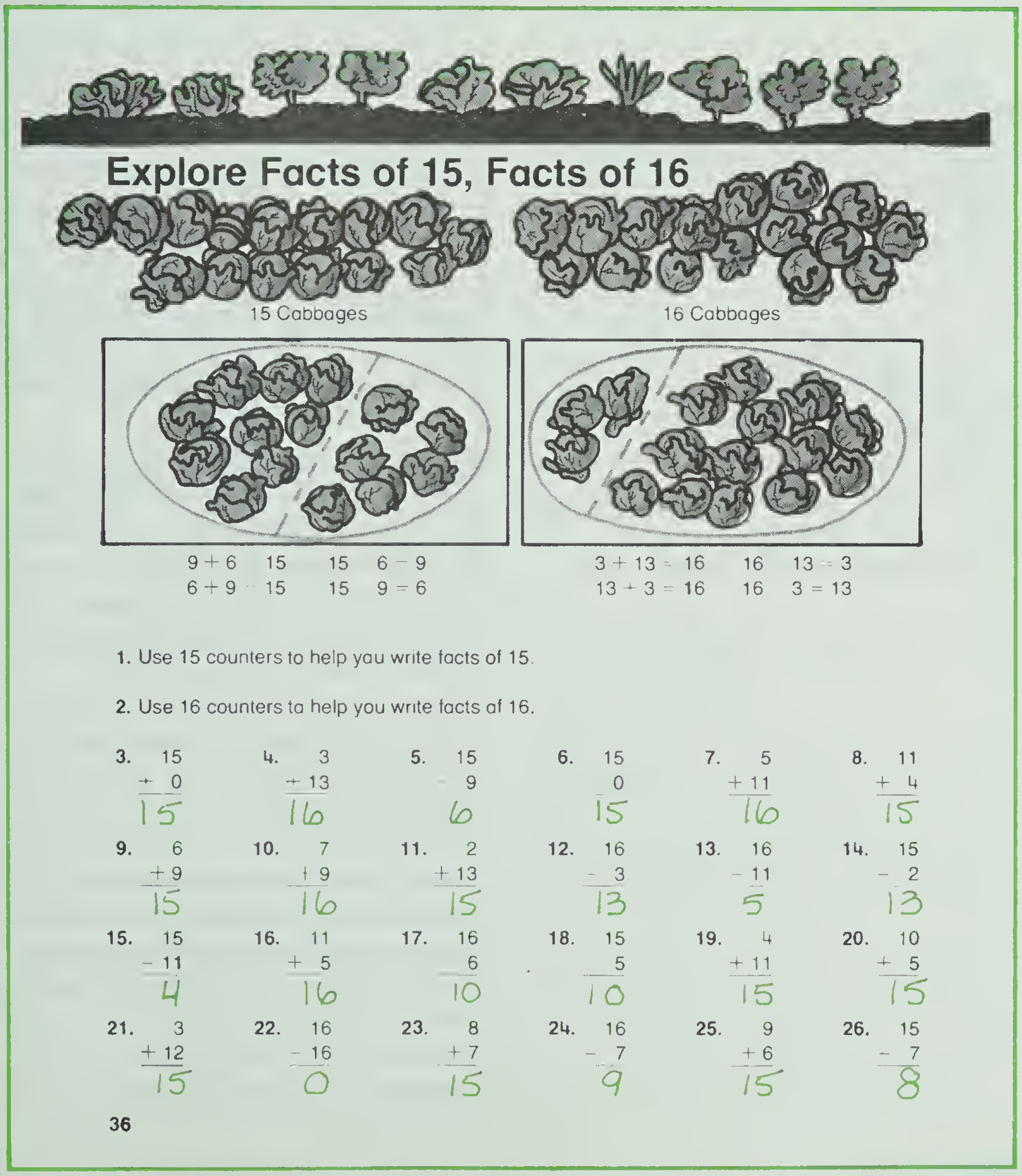
Use 16 counters and the preceding activity for developing the addition and subtraction facts of 16.

3

Children can draw arrows on a number line on the easel to represent addition and subtraction facts.

4

Have the children make up and solve word problems involving facts of 15 and 16. Giving the children a topic, such as items in a grocery store, or showing them a picture may help them to think of word problems.



Explore Facts of 15, Facts of 16

15 Cabbages

16 Cabbages

9 + 6 = 15   15 − 6 = 9
6 + 9 = 15   15 − 9 = 6

3 + 13 = 16   16 − 13 = 3
13 + 3 = 16   16 − 3 = 13

1. Use 15 counters to help you write facts of 15.

2. Use 16 counters to help you write facts of 16.

3. 15 + 0 15	4. 3 + 13 16	5. 15 − 9 6	6. 15 − 0 15	7. 5 + 11 16	8. 11 + 4 15
9. 6 + 9 15	10. 7 + 9 16	11. 2 + 13 15	12. 16 − 3 13	13. 16 − 11 5	14. 15 − 2 13
15. 15 − 11 4	16. 11 + 5 16	17. 16 − 6 10	18. 15 − 5 10	19. 4 + 11 15	20. 10 + 5 15
21. 3 + 12 15	22. 16 − 16 0	23. 8 + 7 15	24. 16 − 7 9	25. 9 + 6 15	26. 15 − 7 8

36

Written and Other Activities

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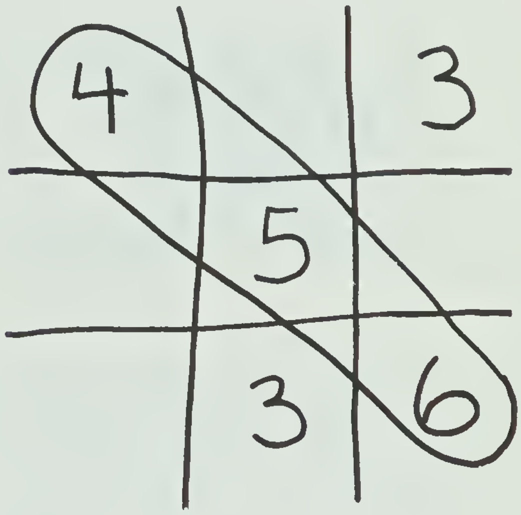
mathways 3, page 36

The children will need 16 counters and a Fact Finder to complete questions 1 and 2.

☐ ☐

To practise adding three numbers with a sum of 15, two children can play the following version of Xs and Os. One player is allowed to use the numerals 1, 3, 5, 7 and 9; the other uses the numerals 2, 4, 6, 8 and 10. Players can use their assigned numerals as often as they wish in a game. The children take turns writing the numerals in a space. The player who writes the third numeral in a row, column or diagonal with a sum of 15 is the winner. For the example shown, the numerals were written in the following order: 3, 4, 3, 6, 5. The player who was using the odd numbers won the game.



☐ ☐ ☐

Have the children show some of the addition and subtraction questions on *mathways* page 36 on number lines.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 7

Unit 1 Section 4 Lesson 2

Exploring Addition and Subtraction Facts of 17 and 18

Materials

- display-size addition chart, *see* **3**
- number line
- for each child
  - Fact Finder: Program Master 15
  - 18 counters
  - addition chart, reproduced from Program Master 23 and/or 21
- for each group
  - *Concentration* cards, *see* □ □

Lesson

1

Seat the children around the working area. Give each child a Fact Finder and 17 counters.

Put 12 counters in one section of your Fact Finder and five counters in the other section. What addition sentence can we write to show this?

When a child has responded, record the sentence on the easel.

12 + 5 = 17

Ask

What other addition sentence can we write?

Record on the easel

5 + 12 = 17

What two subtraction sentences can we write to complete this fact family?

Record

17 − 5 = 12   17 − 12 = 5

Have the children record the fact family in their notebooks. Invite children to suggest the placement of other groups of counters and write the appropriate fact families on the easel for the other group members to record.

2

Add a counter to each child's set and repeat step **1** to develop facts of 18.

3

Prepare an addition chart, writing the numerals 0 to 9 along the top and side of a blank chart. The chart can be used to develop the basic addition and subtraction facts to 18. For basic addition facts, both addends are one-digit numerals; basic subtraction facts are those that are related to the basic addition facts.

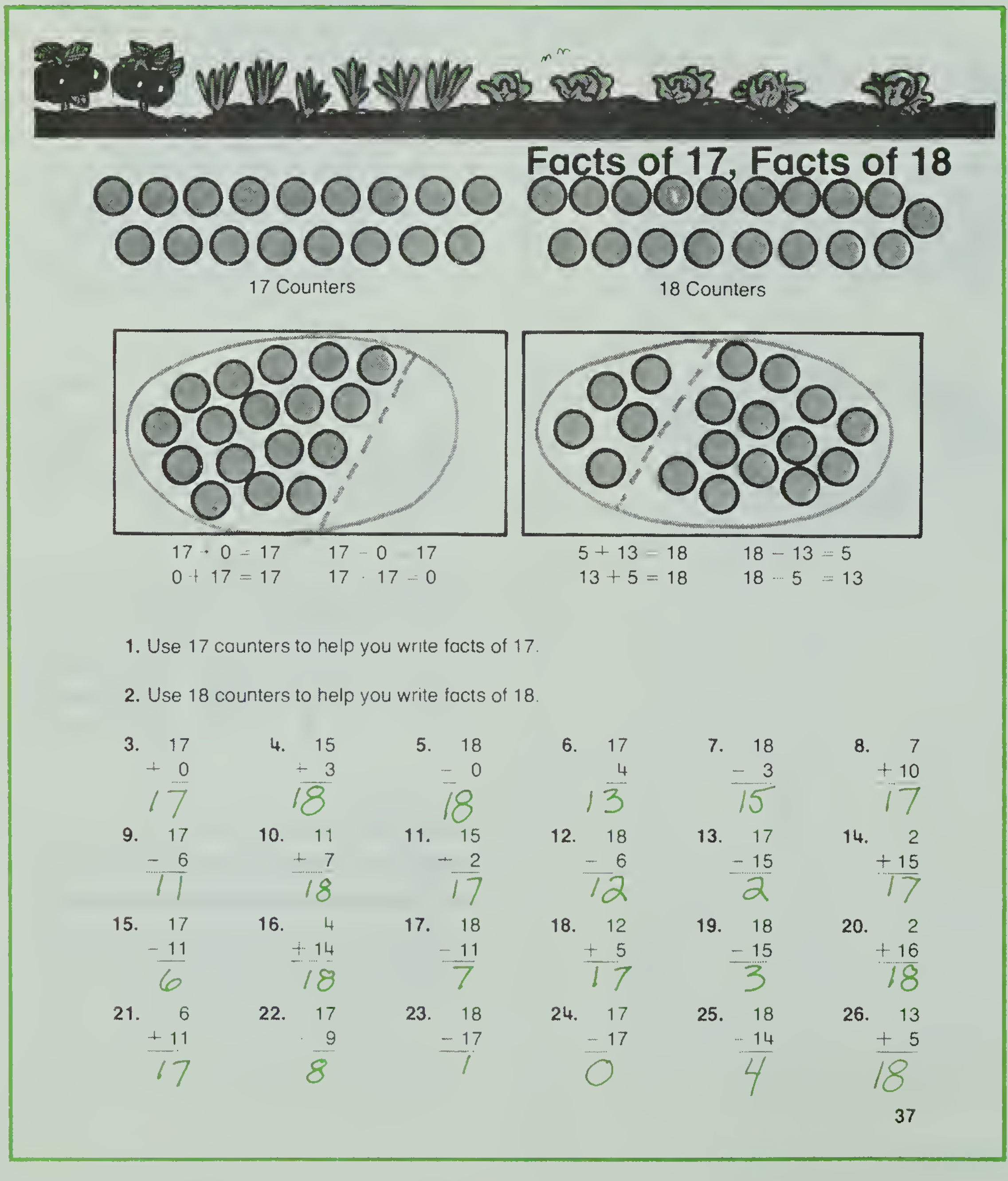
+	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

Display the addition chart. Point to the space for 0 + 0 and have a child give the sum. Record the sum on the chart. Then point to the space for 0 + 1 and have another child give the sum. Record this sum. Continue in this manner until all the spaces for addition facts to 18 have been filled. Note that the facts for which the addends are different will be recorded twice in the chart.

4

Discuss how the chart shows the addition and subtraction facts to 18. For example, the place where the row for 9 and the column for 2 meet shows that

9 + 2 = 11   11 − 2 = 9
2 + 9 = 11   11 − 9 = 2



Facts of 17, Facts of 18

17 Counters

18 Counters

17 + 0 = 17   17 − 0 = 17
0 + 17 = 17   17 − 17 = 0

5 + 13 = 18   18 − 13 = 5
13 + 5 = 18   18 − 5 = 13

1. Use 17 counters to help you write facts of 17.

2. Use 18 counters to help you write facts of 18.

3. 17 + 0 17	4. 15 + 3 18	5. 18 − 0 18	6. 17 4 13	7. 18 − 3 15	8. 7 + 10 17
9. 17 − 6 11	10. 11 + 7 18	11. 15 + 2 17	12. 18 − 6 12	13. 17 − 15 2	14. 2 + 15 17
15. 17 − 11 6	16. 4 + 14 18	17. 18 − 11 7	18. 12 + 5 17	19. 18 − 15 3	20. 2 + 16 18
21. 6 + 11 17	22. 17 9 8	23. 18 − 17 1	24. 17 − 17 0	25. 18 − 14 4	26. 13 + 5 18

37

5

Ask the children

What patterns can you find in the chart?

They may notice that the sums increase by one across each column and down each row, and increase by two along each diagonal from the top left to the bottom right. The children may say that the sums along each diagonal from the bottom left to the top right are the same.

Written and Other Activities

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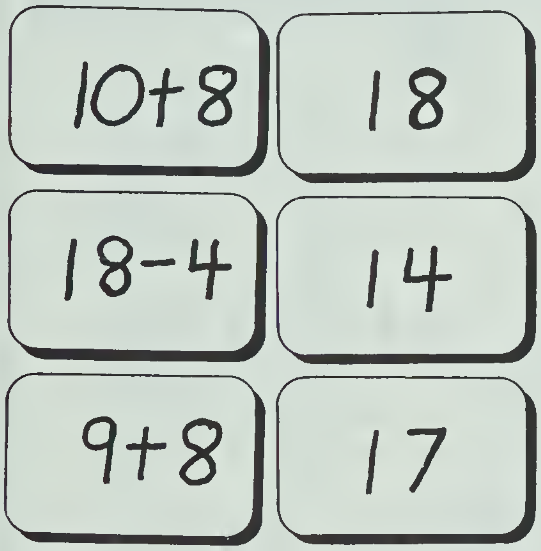
mathways 3, page 37

Give each of the children a copy of Program Master 23. Have them complete the addition charts.

☐ ☐

Prepare 20 pairs of cards for the game *Concentration.*



Three or four children can play the game. They place the cards in an array, face down on the table. The first player turns over two cards. If the cards match, the player keeps them and turns over two other cards. This continues until the player turns over two cards that do not match. In this case, the player places the cards on the table where they were, face down, and the next player takes a turn. The player with the most cards after all the cards have been claimed is the winner.

☐ ☐ ☐

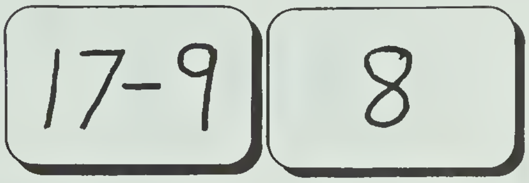
Give each of the children a blank 100-chart and have them complete the addend row and column by writing the numerals from 0 to 9 in any order.

+	3	7	0	5	8	2	9	1	6	4
6										
3										
1										
8										
4										
0										
9										
7										
2										
5										

Have the addition charts completed.

☐ ☐ ☐ ☐

Ask each of the children to make a list of the addition and subtraction facts which are difficult for them. Have the children make personal sets of flash cards for practise purposes. The addition or subtraction expression is written on one side and the sum or difference on the reverse.



Give the children lots of opportunities to use the cards.

☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters pages 8, 60 and 61

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 11, 12, 93 and 94

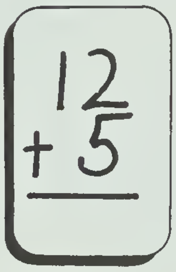
☐ ☐ ☐ ☐ ☐ ☐ ☐

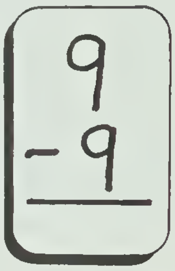
You may wish to send home a letter to keep parents informed of what is happening in the mathematics class. The following may serve as a model.

Dear Parent or Guardian;

Here is one of those Math notes I promised you: In Math recently, we have been learning the addition and subtraction facts to 18. You will see those facts on pages 10 to 19, pages 27 and 28, and pages 36 and 37 of ***mathways 3.*** *Your child needs to know those facts well. Here are some ways you can help.*

- *Take an old deck of playing cards. Cross out the 1 in each 10 to make it a 0. Discard the face cards and rename each ace as 1. Shuffle the remaining cards and turn over two cards. Ask your child to tell you both the sum of the two numbers and the difference between them.*
- *Another thing you might try is to record each of the facts on a separate piece of card. Recipe cards work well.*





Every day have your child learn six facts well. Of course, keep recalling the facts learned on previous days.

- *Page 39 of mathways 3 suggests an activity. Try it out with your child.*

There are four important things to remember when you are helping your child.

1. *Keep each drill session short.*
2. *Don't try to have your child learn too much at any one time.*
3. *Give lots of praise.*
4. *Make it a fun time!*

Thanks for helping!

Unit 1 Section 4 Lesson 3

Recalling Facts to 18, Five-Minute Intervals and Regrouping Tens and Ones, Byway: Recalling Fact Families

Materials

- display-size nomograph, *see* ☐ ☐
- for each group
  - blank cards or deck of old playing cards
- for each child
  - copy of a nomograph, reproduced from Program Master 26

Rationale

Byways and Retrace Your Steps pages are special features of *mathways 3* to *6*. Both appear at least twice in each unit.

The Byways have a number of purposes. Sometimes they challenge the students, sometimes they give a new perspective to a concept already presented, sometimes they simply add to the enjoyment of mathematics. Generally they are appropriate for all students. Retrace Your Steps pages recall important mathematics concepts already presented. Their chief purpose is to keep those ideas fresh and functional. They should help both student and teacher see where additional work, if any, needs to be done. The teacher may want to keep a record of each child's performance. If additional practice is needed, you may wish to use some of the exercises provided in the Checks and Practices at the end of each unit, or in the Further Practice exercises at the back of the text.

Lesson

1

Invite the children to join you in the working area. Ask

What is the sum of six and five?

Invite the child who answers to ask another addition question. Continue the activity until all the children have had an opportunity to ask a question and several addition facts to 18 have been reviewed. Then invite the children to ask for differences, so that subtraction facts to 18 can be recalled.

2

Review five-minute intervals by asking questions such as the following:

What time is it now?

Write the time in two ways on the easel

10:15 ten fifteen

What time will it be fifteen minutes from now?

Have a child write the time on the easel. Then invite the children to ask time questions and write the times on the easel.

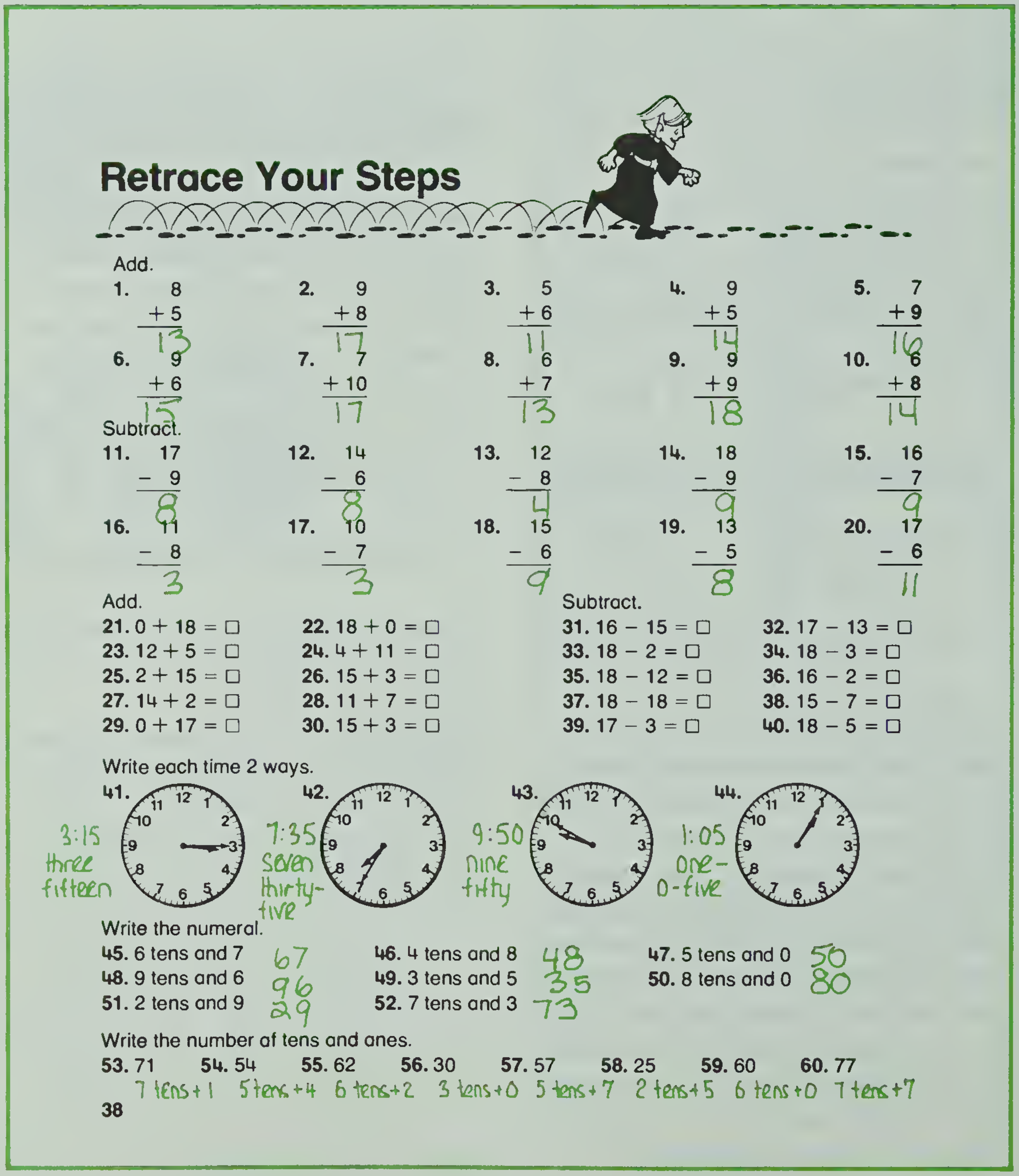
3

Review place value, asking questions such as

What is the numeral for 6 tens and 1?

Have the children write the numerals on the easel.

Then invite a child to write a numeral on the easel, for example *93*, and have the other children tell how many tens and ones each represents. Repeat several times.



Retrace Your Steps

Add.

1. 8 + 5 13
2. 9 + 8 17
3. 5 + 6 11
4. 9 + 5 14
5. 7 + 9 16
6. 9 + 6 15
7. 7 + 10 17
8. 6 + 7 13
9. 9 + 9 18
10. 6 + 8 14

Subtract.

11. 17 − 9 8
12. 14 − 6 8
13. 12 − 8 4
14. 18 − 9 9
15. 16 − 7 9
16. 11 − 8 3
17. 10 − 7 3
18. 15 − 6 9
19. 13 − 5 8
20. 17 − 6 11

Add.

21. 0 + 18 = ☐
22. 18 + 0 = ☐
23. 12 + 5 = ☐
24. 4 + 11 = ☐
25. 2 + 15 = ☐
26. 15 + 3 = ☐
27. 14 + 2 = ☐
28. 11 + 7 = ☐
29. 0 + 17 = ☐
30. 15 + 3 = ☐

Subtract.

31. 16 − 15 = ☐
32. 17 − 13 = ☐
33. 18 − 2 = ☐
34. 18 − 3 = ☐
35. 18 − 12 = ☐
36. 16 − 2 = ☐
37. 18 − 18 = ☐
38. 15 − 7 = ☐
39. 17 − 3 = ☐
40. 18 − 5 = ☐

Write each time 2 ways.

41. 3:15 three fifteen
42. 7:35 seven thirty-five
43. 9:50 nine fifty
44. 1:05 one-o-five

Write the numeral.

45. 6 tens and 7 67
46. 4 tens and 8 48
47. 5 tens and 0 50
48. 9 tens and 6 96
49. 3 tens and 5 35
50. 8 tens and 0 80
51. 2 tens and 9 29
52. 7 tens and 3 73

Write the number of tens and ones.

53. 71 7 tens + 1
54. 54 5 tens + 4
55. 62 6 tens + 2
56. 30 3 tens + 0
57. 57 5 tens + 7
58. 25 2 tens + 5
59. 60 6 tens + 0
60. 77 7 tens + 7

38

Written and Other Activities

☐

mathways 3, pages 38, 39

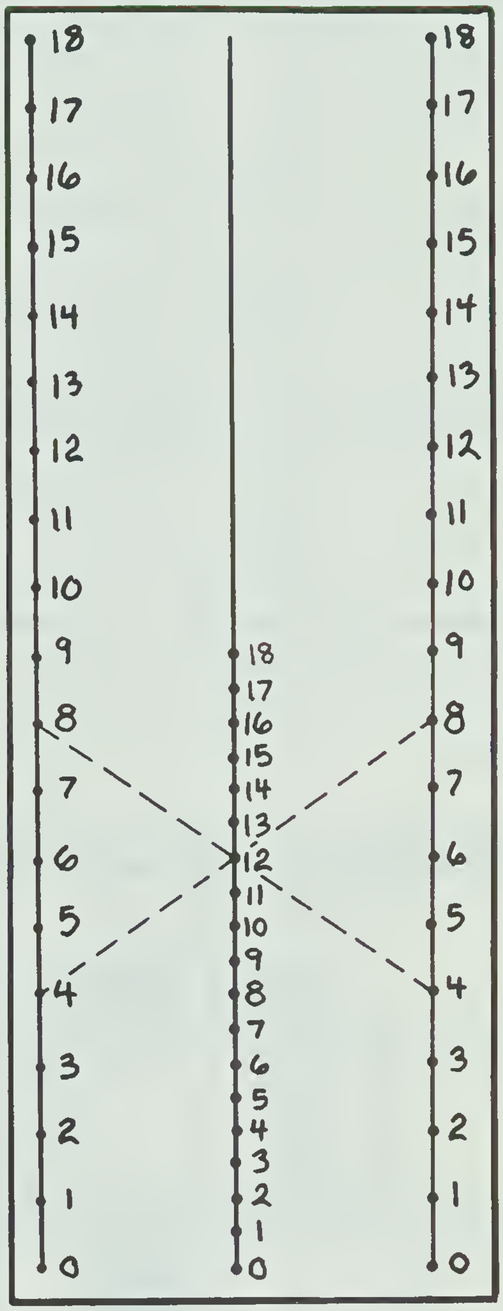
If time is short, the game on page 39 can be played with two suits from a deck of old playing cards. Each group of players uses the aces for ones, two face cards for zero, and they discard the remaining face cards.

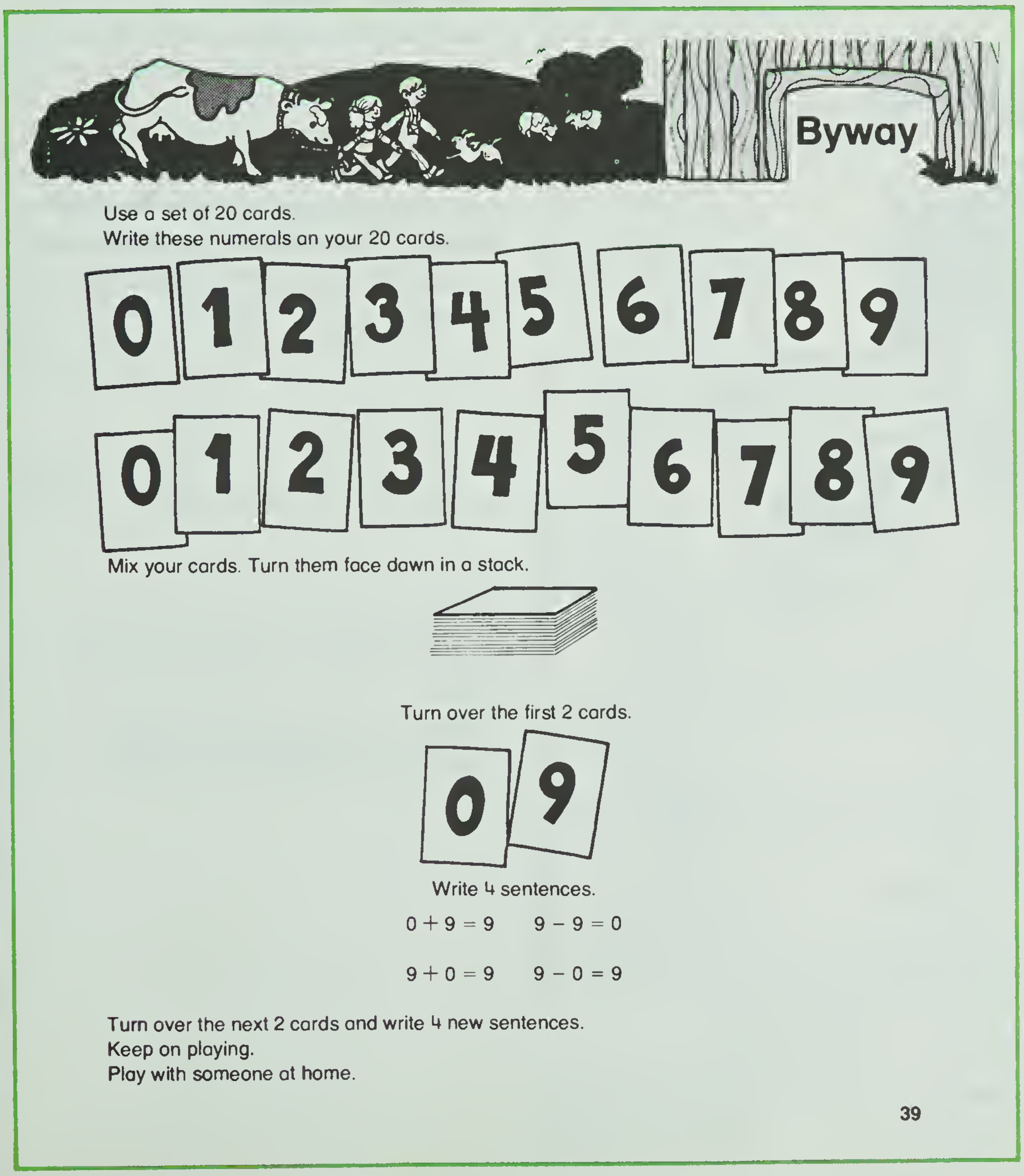
☐ ☐

Display a large nomograph, without the dotted lines. Explain how a nomograph can be used to find sums and differences: when a straight edge joins an addend on the left number line and an addend on the right number line, their sum is at the place where the straight edge meets the centre number line; when a straight edge joins a minuend on the centre line and a subtrahend on the left or right number line, the difference is shown where the straight edge meets the other number line. Either of the dotted lines can be used to find the sum of 8 and 4, the difference of 12 and 4 or the difference of 12 and 8.

☐ ☐ ☐

Give each child a copy of a nomograph. Have the children use it to check their answers to the addition and subtraction questions on page 38, or to complete other exercises.





Use a set of 20 cards.
Write these numerals on your 20 cards.

Mix your cards. Turn them face down in a stack.

Turn over the first 2 cards.

Write 4 sentences.

0 + 9 = 9   9 − 9 = 0

9 + 0 = 9   9 − 0 = 9

Turn over the next 2 cards and write 4 new sentences.
Keep on playing.
Play with someone at home.

39

Unit 1 Section 4 Lesson 4

Interpreting Concrete Graphs, Making Concrete Graphs

Materials

- masking tape
- cardboard stands
- for each child
  - interlocking cubes

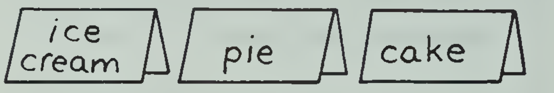
Rationale

Graphing involves making and interpreting graphs: the two skills are complementary. As children organize and present material in graph form, they are developing an understanding of graphs, which helps them interpret other graphs. Similarly, interpreting graphs helps children make other graphs. The presentation in *mathways 3* assumes that Grade Three children have experienced some graphing in previous grades. If they have not, more time should be spent making and interpreting concrete graphs. Encourage the children to be aware of graphs in books and in their environment to provide practice in graphing and to show how graphing is used. The skills acquired in graphing can be used for social studies, science, or language. Having the children draw graphs to show information in other subjects provides more graphing experience and helps them observe relationships important in other subject areas.

Lesson

1

Use masking tape to line a region of the classroom floor, as illustrated on the following page, for building a three-column concrete graph. Cut and paste pictures from magazines or record the names of three desserts on cardboard stands and place a stand at the beginning of each column.

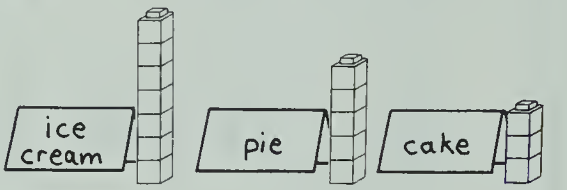


Have the children seat themselves in a column according to their dessert choices. Use these questions to discuss the resulting graph:

Which dessert is the favourite?
How can you tell?
How many chose pie?
How many chose pie and cake?
How many more chose pie than ice cream?

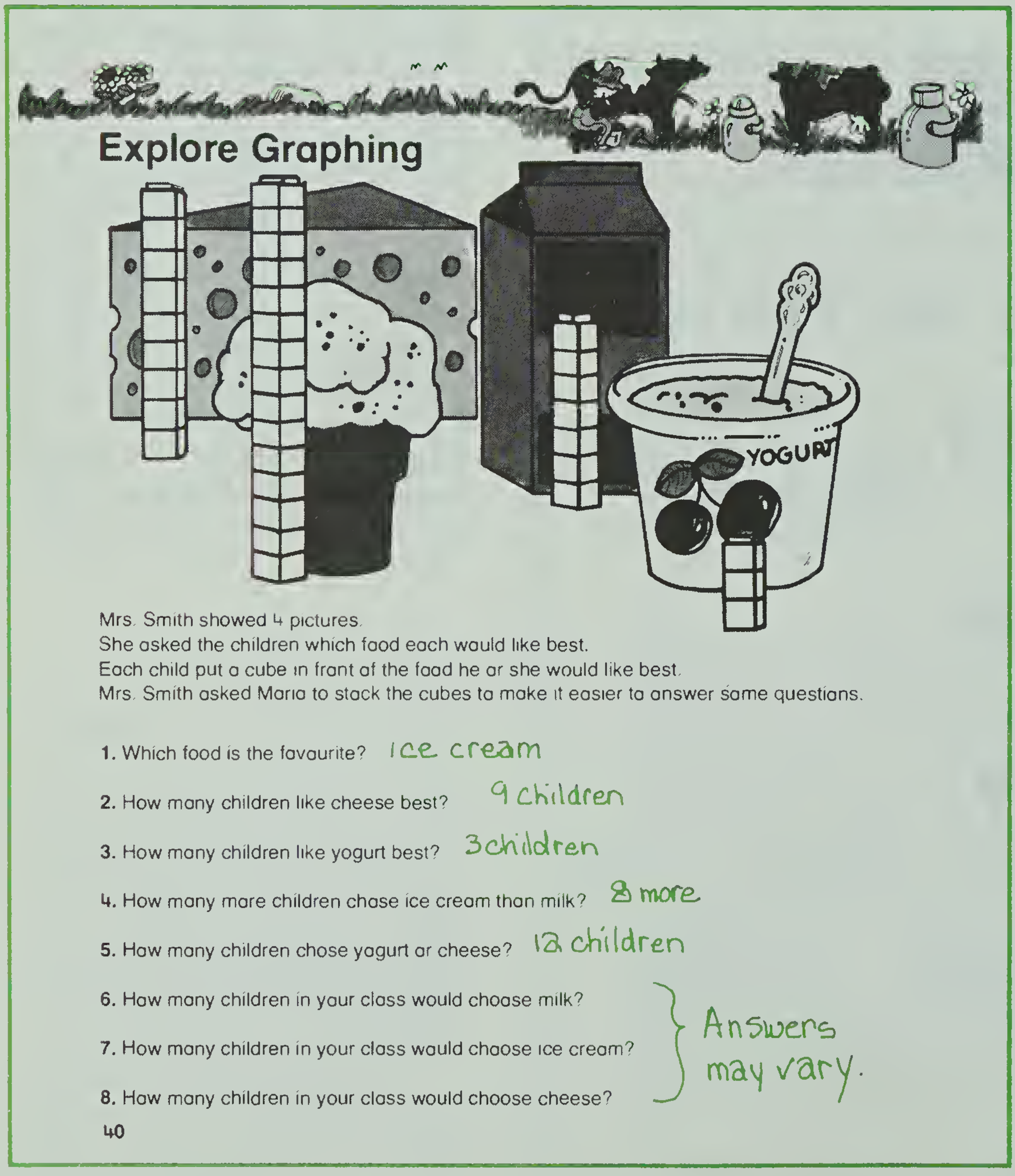
2

Provide each child with an interlocking cube. Have each child place the cube beside the cardboard stand that indicates the choice of dessert.



Tell the children that this is a graph and that each cube stands for one child.

Discuss the graph using the type of questions developed for activity 1.



Explore Graphing

Mrs. Smith showed 4 pictures.
She asked the children which food each would like best.
Each child put a cube in front of the food he or she would like best.
Mrs. Smith asked Maria to stack the cubes to make it easier to answer some questions.

1. Which food is the favourite? ice cream
2. How many children like cheese best? 9 children
3. How many children like yogurt best? 3 children
4. How many more children chose ice cream than milk? 8 more
5. How many children chose yogurt or cheese? 12 children
6. How many children in your class would choose milk?
7. How many children in your class would choose ice cream?
8. How many children in your class would choose cheese?

} Answers may vary.

40

Written and Other Activities

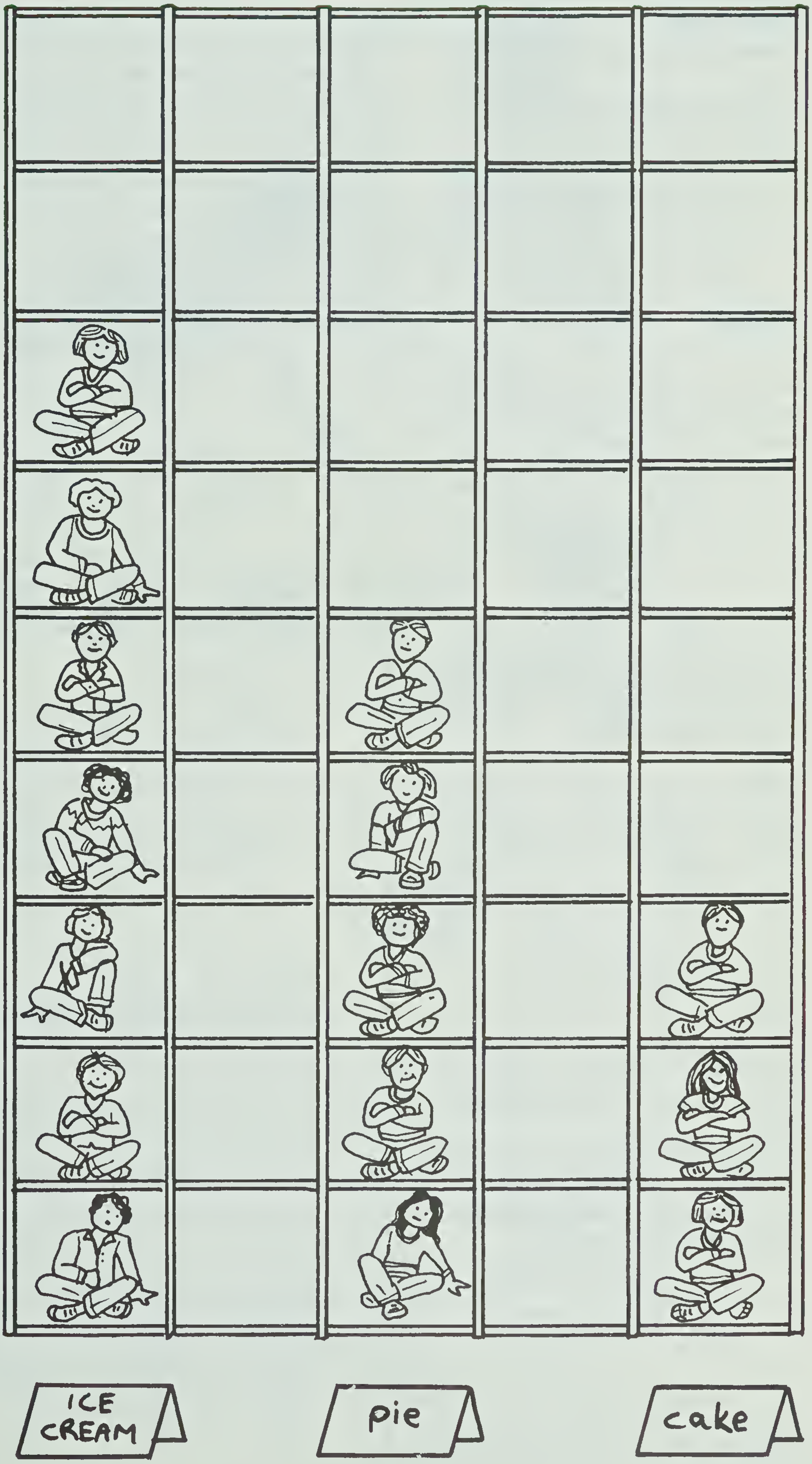
☐

mathways 3, page 40

Discuss the graph on page 40 before the children do the exercises. For exercises 6 to 8, have the children show their choices by placing interlocking cubes beside the names of the foods written on the easel.

☐ ☐

Have the children make concrete graphs for the class or for a small group of children. Interlocking cubes or other objects, such as toothpicks or pieces of paper, can be the concrete material for the graphs. Topics for the graphs can be favourite sports, favourite games, favourite books, or favourite movies. Then use the graphs for questions. The questions can be oral or written, and they can be created by the teacher or the children. Asking each other questions about a graph they have made helps children understand both making and interpreting graphs. Questions can be how many children made a choice, what choice was made by most children, what choice was made by fewest children.



Unit 1 Section 4 Lesson 5

Making and Interpreting Pictographs

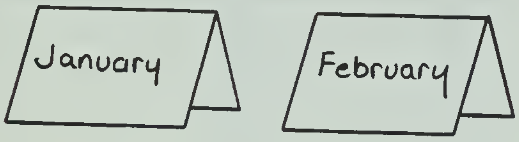
Materials

- cards showing the months of the year
- easel-size birthday graph form, 5 cm grid, *see mathways 3 page 41*
- for each child
  - – interlocking cube
  - – 5 cm by 5 cm square of paper
  - – 2 cm grid paper, reproduced from Program Master 6

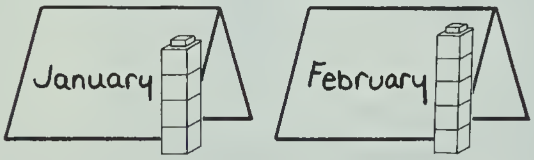
Lesson

1

Gather the children into the working area. Line up the cards indicating the months of the year in order.



Give each child an interlocking cube. Have the children stack their cubes in front of the month of their birthdays to make a concrete graph.



Ask questions such as
How many children were born in May?
In what month were most children born?
In what month were fewest children born?
How many children were born in June and July?
How many more children were born in January than in November?

2

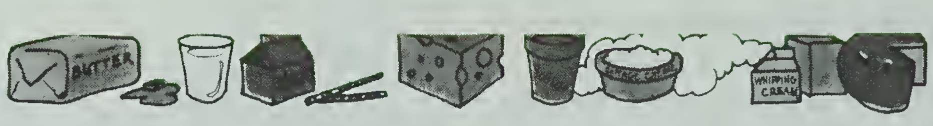
Prepare an easel-size birthday graph form like the one illustrated on *mathways 3* page 41. A suitable grid size is 5 cm by 5 cm. If that size is chosen, provide each child with a 5 cm by 5 cm square of paper on which to draw a self portrait. Have the children, in turn, place their portraits in the appropriate column of the graph form. When the birthday graph is complete, discuss the information it shows.

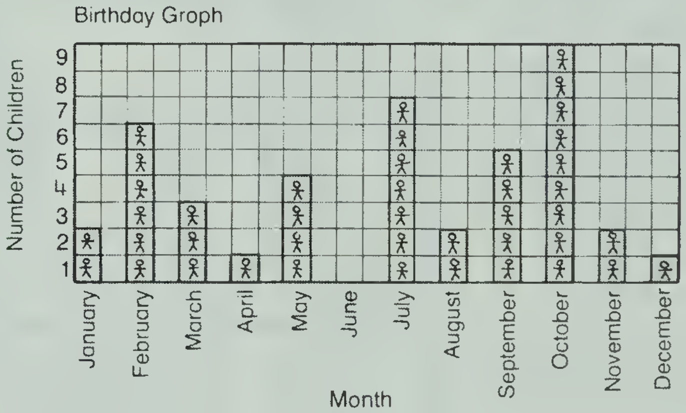
Written and Other Activities

☐

mathways 3, page 41

Tell the children that the graph on page 41 is called a pictograph, since it is made with pictures rather than cubes, but both graphs give the same information. Discuss the graph and the information it shows about the children in Mrs. Zen's class, explaining that each picture represents one child in the same way that each picture or cube in the graphs made during the lesson represents one child. Since step 2 of the lesson is identical to question 7 of the In Action exercise, the children may wish to make graphs of their own by drawing other objects,





The children in Mrs. Zen's class made a birthday graph.
Each child drew a stick figure on a 5 cm by 5 cm piece of paper to show the month of his or her birthday.
Each square was put on the graph.

In Action

1. How many children were born in March? 3 children
2. How many children were born in July? 7 children
3. In what month were the most children born? October
4. In what month were no children born? June
5. In what 3 months were 2 children born? January, August, November
6. How many children were born altogether in February and July? 13 children
7. Make a birthday graph for your class.

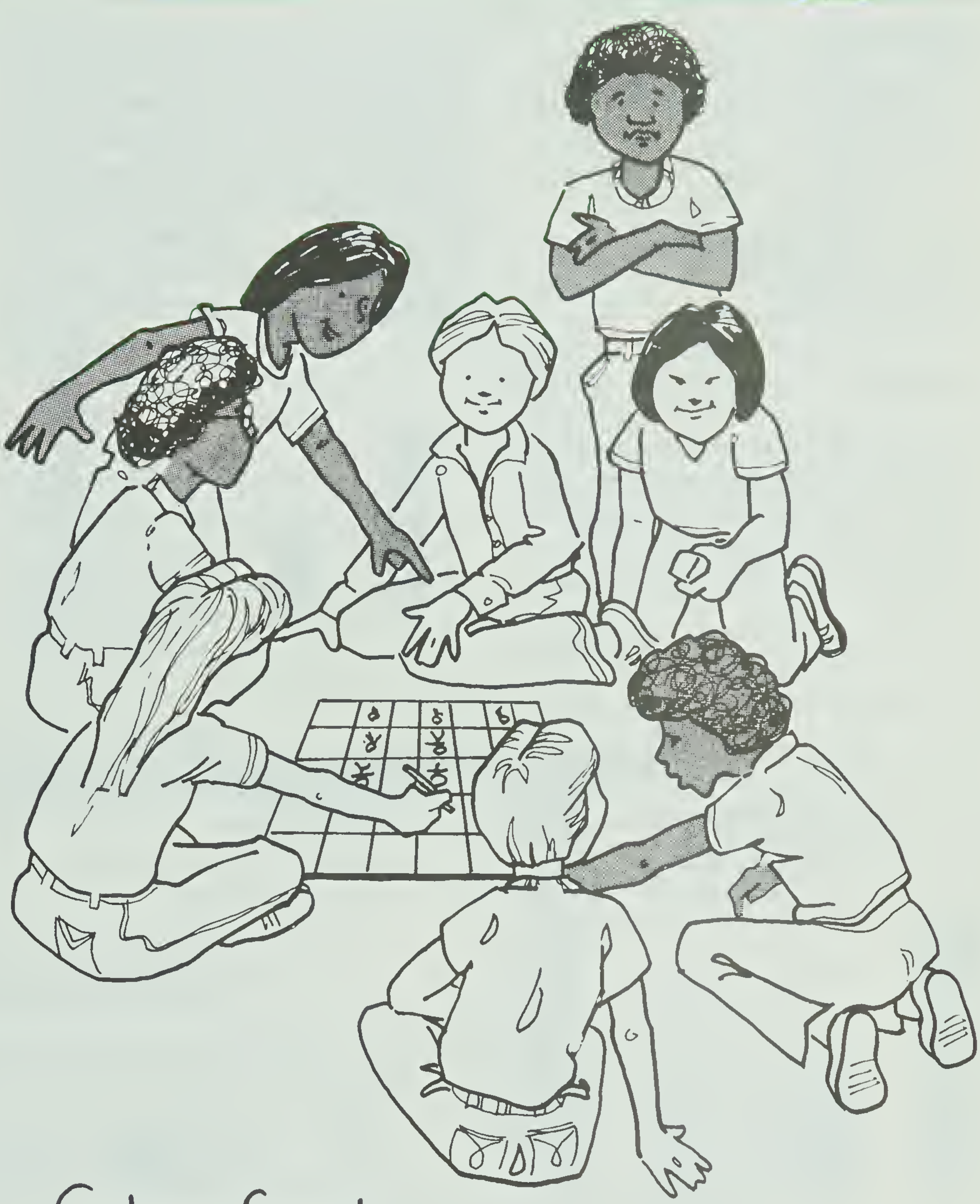
such as birthday cakes or candles. If any children choose to make graphs, have them use copies of Program Master 6.

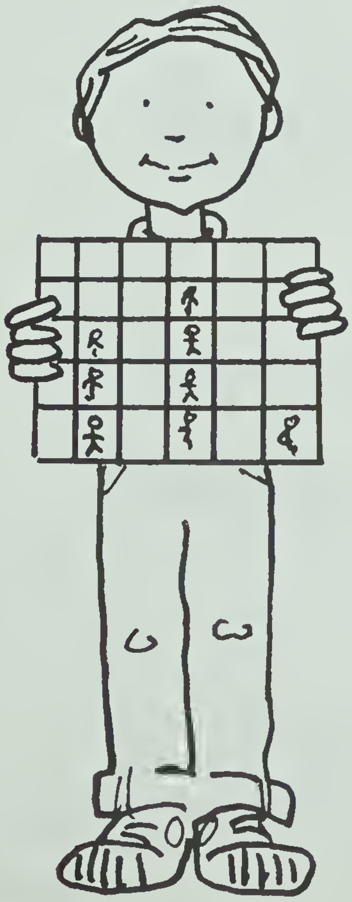
☐ ☐

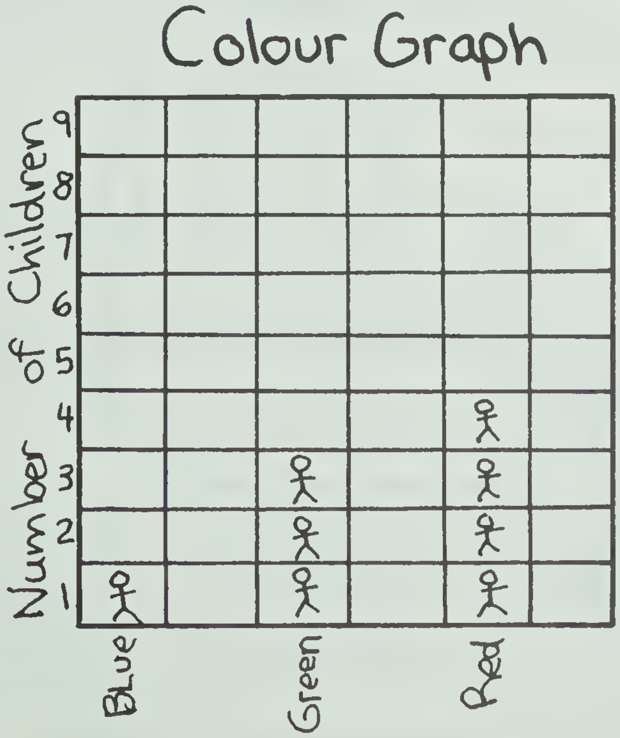
Have each child draw a pictograph of the topic of the concrete graph described on *mathways 3* page 40, questions 1-5. Distribute copies of Program Master 6. Make up the concrete graph, using interlocking cubes. Display the pictographs made by class members beside the concrete graph so that the children can compare ways of graphing the same information.

☐ ☐ ☐

Divide the class into groups of seven or eight. Each group member decides on a topic for a pictograph, such as the group's favourite colours or months of the year, questions the other group members and makes a pictograph to show the information collected. Then the children trade and write questions based on the topics. Display the graphs and the corresponding questions together, and have children answer the questions.







1. How many like green?

2. How many like red?

3. What colour is the favourite?

4. How many more like green than blue?

Unit 1 Section 4 Lesson 6

Interpreting Pictographs

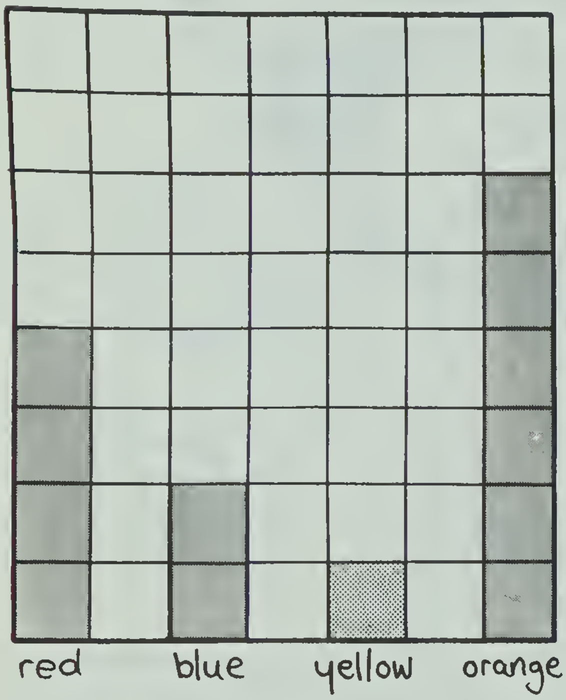
Materials

- coloured construction paper squares
  - – four red
  - – two blue
  - – one yellow
  - – six orange
- colour chart, easel-size
- colour-name cards
- masking tape

Lesson

1

Seat the children around the working area. Put the construction paper squares on the floor in a scattered arrangement. Place the chart on the easel. Write the names of the colours.



Tell the children that they are going to make a graph to show the number of paper squares in each colour. To make the graph, a child names a colour and places one square of that colour at the side of the table. Another child shades the appropriate colour square on the chart. Continue until all the squares have been recorded on the graph. Ask the following questions:

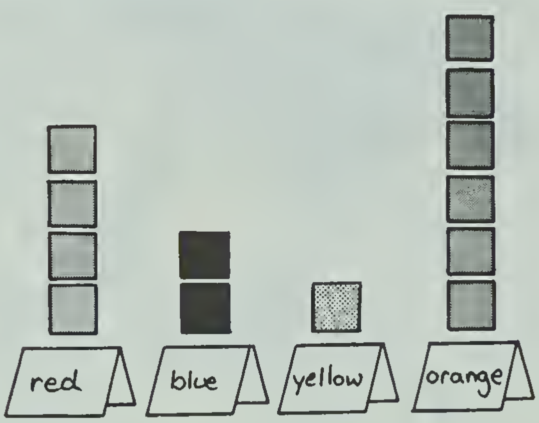
How many squares of red paper does the graph show?

How many squares of blue and yellow paper?

How many more squares of orange paper than yellow paper are there?

2

Place the colour-name cards on the table. Have the children line up the squares of paper in front of the appropriate cards. Discuss that this is also a graph showing the number of paper squares in each colour. Compare the two graphs, emphasizing that both show the same information.



Written and Other Activities

☐

mathways 3, page 42

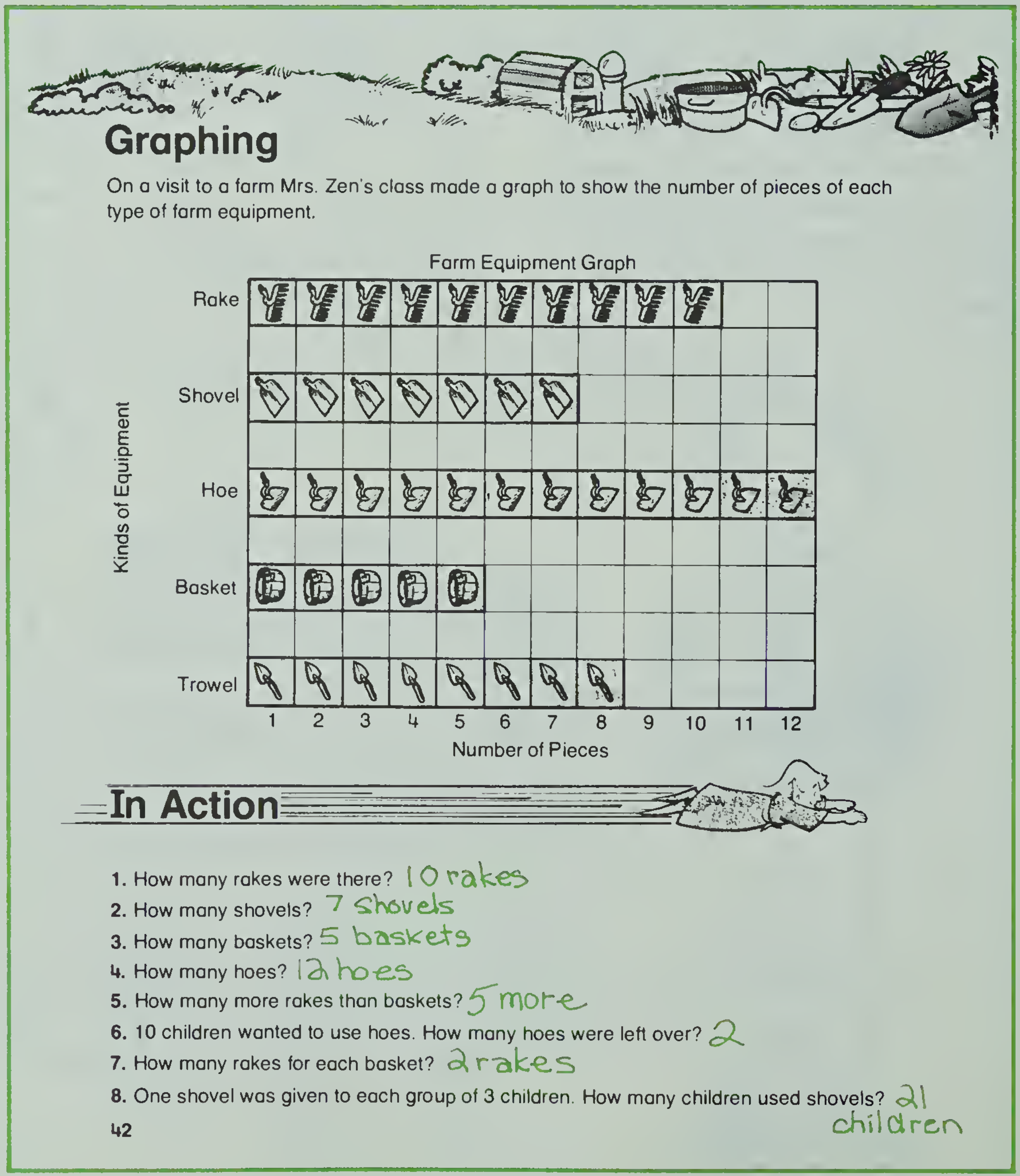
Discuss the graph shown, emphasizing that each picture represents one piece of farm equipment. Then assign the In Action exercise.

☐ ☐

mathways 3 Tests 2A, 2B

☐ ☐ ☐

mathways 3 Plus Workbook page 13



Graphing

On a visit to a farm Mrs. Zen's class made a graph to show the number of pieces of each type of farm equipment.

Farm Equipment Graph
Rake
Shovel
Hoe
Basket
Trowel
Kinds of Equipment
1
2
3
4
5
6
7
8
9
10
11
12
Number of Pieces

In Action

1. How many rakes were there? 10 rakes
2. How many shovels? 7 shovels
3. How many baskets? 5 baskets
4. How many hoes? 12 hoes
5. How many more rakes than baskets? 5 more
6. 10 children wanted to use hoes. How many hoes were left over? 2
7. How many rakes for each basket? 2 rakes
8. One shovel was given to each group of 3 children. How many children used shovels? 21 children

42

Unit 1 Section 5 Lesson 1

Exploring Multiplication: Sets of Two; The Symbol ×

Materials

- for each child
  - counters
  - five paper plates

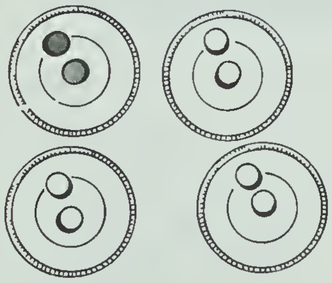
Rationale

Most children will have experienced some readiness for multiplication in grade 2. When beginning work on multiplication, the emphasis is on equal sets. Section 5 introduces multiplication by means of equal sets and repeated addition. It is important that the children realize that there are various ways of approaching multiplication. For example

5 sets of 2
$2 + 2 + 2 + 2 + 2$
5 times 2

The three developmental stages in mastering number facts, described earlier, apply to multiplication as well.

During the first stage, the children use concrete materials to help them understand the meaning of multiplication, and they are given many opportunities to make sets containing the same number of objects. For example, instructed to *Make four sets of two*, each child places two counters on each of four pie plates.

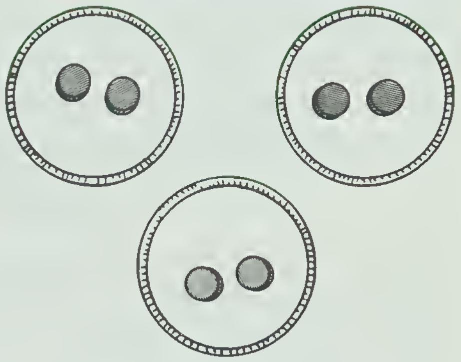


The children in the group then take turns telling the number of sets, the number of objects in each set and the number of objects altogether.
During the second stage, the children discover multiplication facts several times by using concrete materials such as counters. Repeated activities of this kind prepare them for the third, abstract stage.

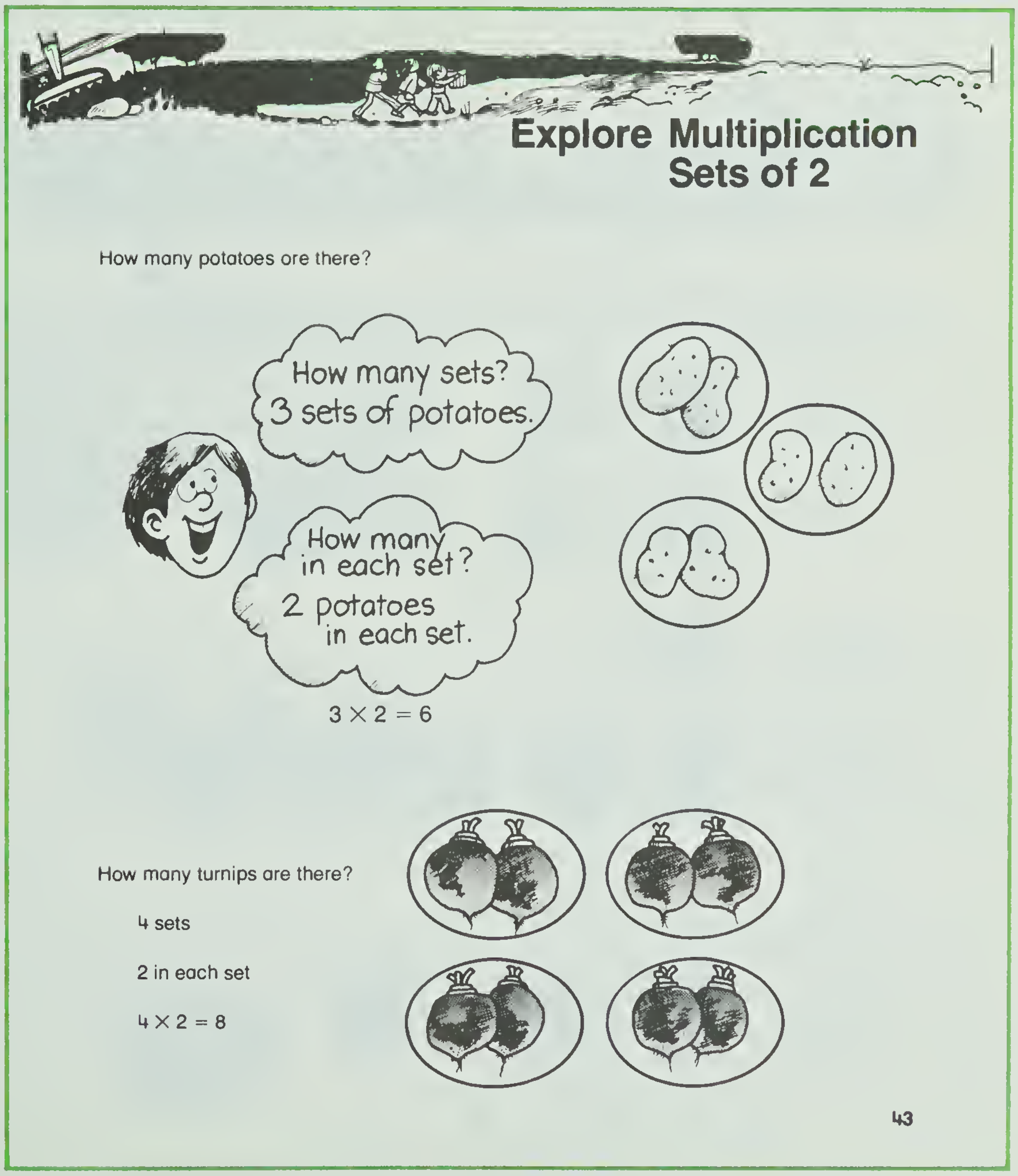
In this final stage, instead of using concrete materials to find a product the children can use a multiplication table, repeated addition or a related multiplication fact. This stage includes frequent review of multiplication facts, so that the children remember what they have learned. Methods of review are suggested under Written and Other Activities.

Lesson

1
Seat the children around the working area. On paper plates show three sets of two counters. Have the children tell the number of the sets, the number of objects in each set and the number of objects altogether.



Write on the easel
3 sets of 2 are 6
3 times 2 equals 6
$3 \times 2 = 6$
Explain the meaning of the symbol ×.
Repeat for
4 sets of 2 = 8
1 set of 2 = 2
5 sets of 2 = 10
0 sets of 2 = 0



Explore Multiplication
Sets of 2

How many potatoes are there?

How many sets?
3 sets of potatoes.

How many in each set?
2 potatoes in each set.

$3 \times 2 = 6$

How many turnips are there?

4 sets

2 in each set

$4 \times 2 = 8$

43

Multiplication with zero and one require special attention. For zero sets of two, explain that each set would have two objects, but there are zero sets.

2

Provide each child with five paper plates and 10 counters.

Show two sets of two counters.
Show three sets of two counters.

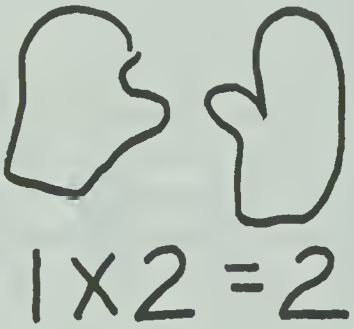
Continue until all the children have shown from zero sets of two to five sets of two. Have them record each as it is illustrated. Have one child write the multiplication sentence on the easel each time. The rest of the group members can use this model to check their own work.

3

Use children to demonstrate sets of two.

4

Have each child draw pictures to show multiplication for sets of two: three pairs of mittens, two pairs of gloves, one pair of shoes. These pictures can be labelled with the corresponding multiplication sentence and displayed.



Written and Other Activities

☐

mathways 3, pages 43, 44

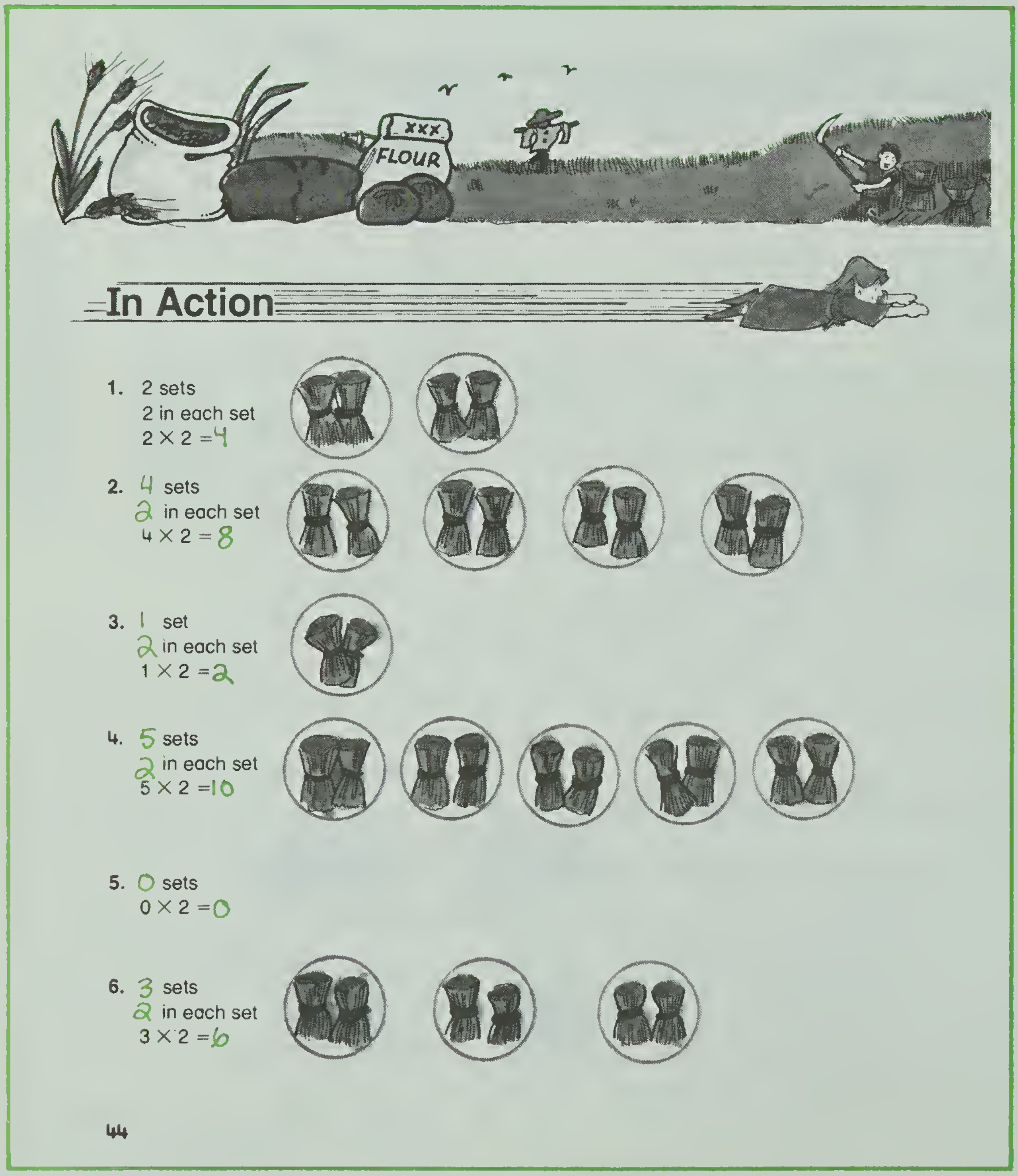
Introduce the word *multiplication* and discuss the example before assigning the In Action exercise. Have the children use counters to find the products that they do not know.

☐ ☐

Provide each child with paper plates and counters. One child says *Three sets of two* or *Three times two* and each of the others uses the paper plates and counters to show three sets of two. Use this activity for 0 × 2 to 5 × 2. Vary this activity by having a child use paper plates and counters to show a multiplication fact for another child to state.

☐ ☐ ☐

Have the children count by twos.



In Action

1. 2 sets
2 in each set
2 × 2 = 4

2. 4 sets
2 in each set
4 × 2 = 8

3. 1 set
2 in each set
1 × 2 = 2

4. 5 sets
2 in each set
5 × 2 = 10

5. 0 sets
0 × 2 = 0

6. 3 sets
2 in each set
3 × 2 = 6

44

Unit 1 Section 5 Lesson 2

Solving Word Problems: Sets of Two

Materials

- slices of bread
- for each child
  - blank cards
  - paper
  - counters
  - five paper plates

Rationale

Solving word problems involving multiplication provides practice with multiplication facts and shows an application of multiplication.

Lesson

1

Gather the children around the working area. Ask them what their favourite kinds of sandwiches are. Discuss their experiences in making sandwiches, and ask how many pieces of bread they used to make a sandwich. Tell the children two slices of bread are used for each sandwich in today's lesson.

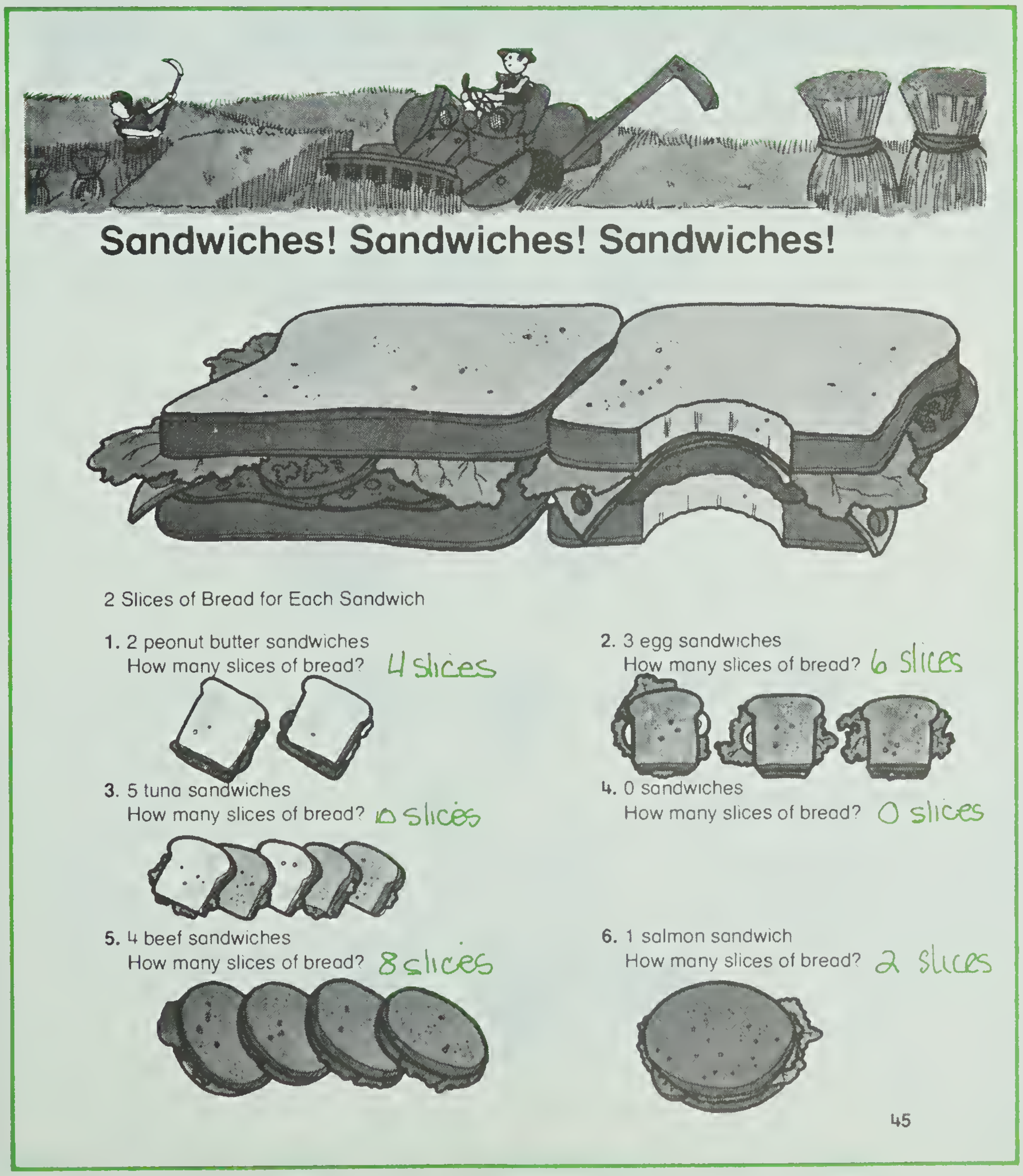
2

Display the slices of bread. Have a child place two slices of bread together for one sandwich.

How many sandwiches are there?
How many slices of bread are there for each sandwich?
How many slices of bread are there altogether?

Write $1 \times 2 = 2$ on the easel, saying *One set of two is two.*

Repeat this activity for three sandwiches, two sandwiches, five sandwiches, zero sandwiches and four sandwiches, paying special attention to the activity for zero sandwiches.



Sandwiches! Sandwiches! Sandwiches!

2 Slices of Bread for Each Sandwich

1. 2 peonut butter sandwiches
How many slices of bread? 4 slices

2. 3 egg sandwiches
How many slices of bread? 6 slices

3. 5 tuna sandwiches
How many slices of bread? 10 slices

4. 0 sandwiches
How many slices of bread? 0 slices

5. 4 beef sandwiches
How many slices of bread? 8 slices

6. 1 salmon sandwich
How many slices of bread? 2 slices

45

Written and Other Activities

☐

mathways 3, page 45

Have the children spend a few moments quietly examining page 45. Ask one of the children to read situation one. Ask another child to tell the same problem without reading it. Have other children demonstrate the two sandwiches with the bread slices. Ask what multiplication sentence should be written. Record on the easel:

$2 \times 2 = 4$
4 slices of bread

Repeat for each of the other situations then assign the page for each child to do again.

☐ ☐

Have the children take turns saying word problems involving sets of two for the others to answer.

two mittens for each child
three children
How many mittens?

Counters on paper plates can be used to illustrate the problem.

Have the corresponding multiplication sentence recorded on the easel.

$3 \times 2 = 6$

two cookies in each package
four packages
How many cookies?

$4 \times 2 = 8$

Children can write word problems like these on cards and exchange cards. Then each child can draw a picture to illustrate the problem on the card, write the corresponding multiplication sentence and answer the question in a sentence.

☐ ☐ ☐

Have the children make sandwiches for a class outing. They can count by twos to determine the number of slices of bread required, gather information about the kinds of sandwiches preferred and help make a class graph showing the results.

Unit 1 Section 5 Lesson 3

Exploring Multiplication: Making Sets of Three

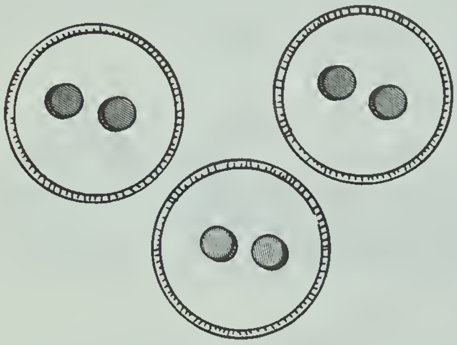
Materials

- cards for illustrating sets of three, *see* ☐ ☐
- multiplication expression cards, *see* ☐ ☐ ☐
- for each child
  - counters
  - five paper plates
  - 12 cm by 12 cm piece of paper

Lesson

1

Seat the children around the working area. Have each of the children take five paper plates and a handful of counters. Recall sets of two. Have each child put counters on paper plates to show three sets of two.



Record the corresponding multiplication sentence on the easel.

3 × 2 = 6

Repeat for

1 × 2 = 2
2 × 2 = 4
4 × 2 = 8
5 × 2 = 10
0 × 2 = 0

2

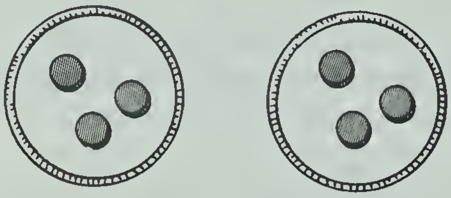
Record a multiplication expression on the easel.

5 × 2

Without explanation ask each of the children to use counters and paper plates to illustrate the expression. After the illustrations have been checked ask several children to explain the meaning of the expression. Discuss the fact that it could mean five sets of two candies or five sets of two kittens or five sets of two of anything. Repeat for other multiplication expressions involving sets of two.

3

Discuss with the children that in this activity they are going to be making sets of three. Ask each child to use counters on paper plates to show two sets of three.



Discuss the number of sets, the number of objects in each set and number of objects altogether.

Write on the easel

2 sets of 3 are 6
2 times 3 equals 6
2 × 3 = 6

Repeat the procedure for

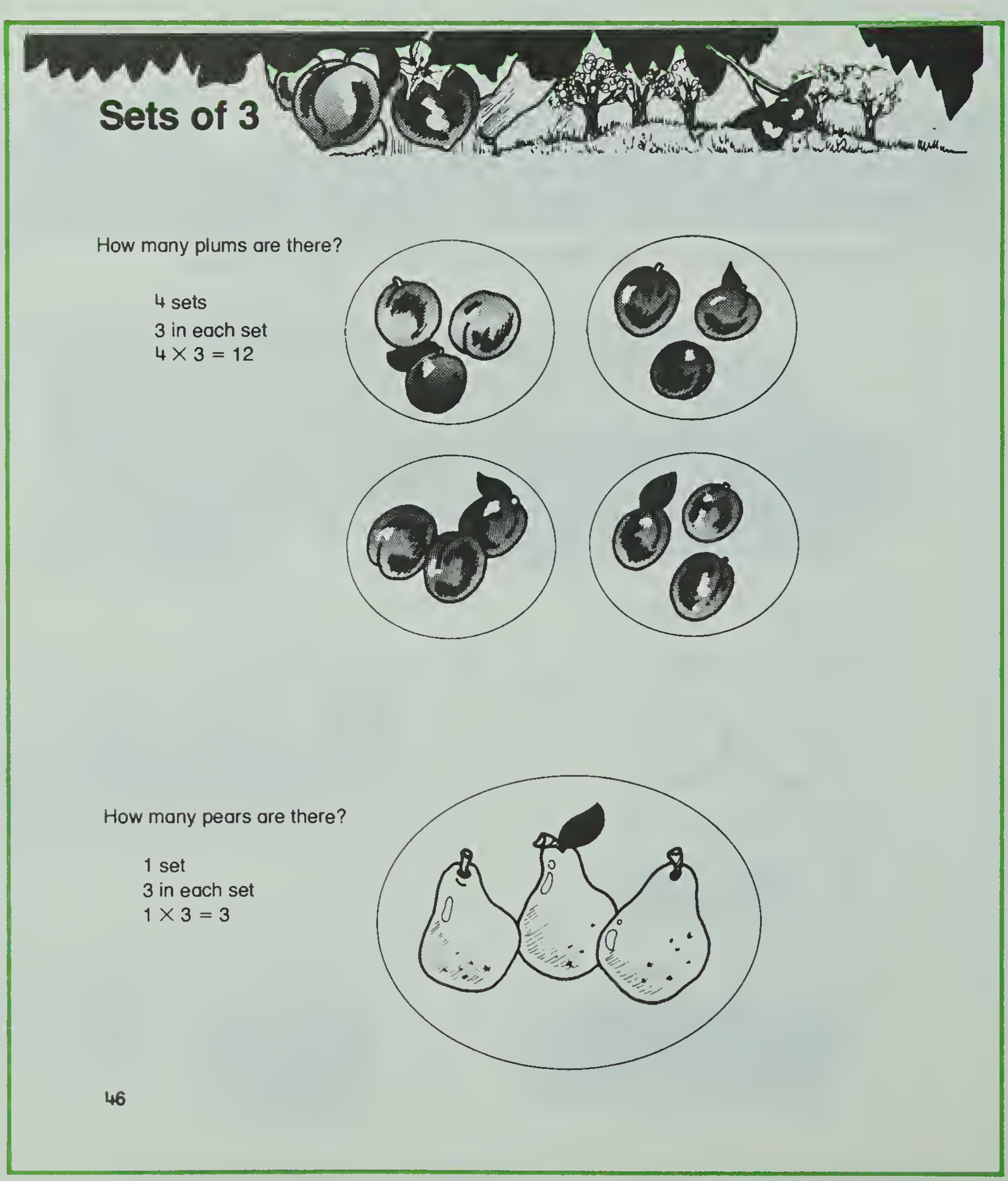
1 × 3 = 3
0 × 3 = 0
3 × 3 = 9
4 × 3 = 12
5 × 3 = 15

4

Record a multiplication expression involving up to five sets of three on the easel.

4 × 3

Without discussion ask each of the children to use counters on paper plates to illustrate the expression. When each child has had an opportunity to illustrate the expression discuss the fact that it could mean four sets of three books or four sets of three birds or four sets of three of anything.



Sets of 3

How many plums are there?

4 sets
3 in each set
4 × 3 = 12

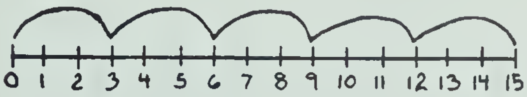
How many pears are there?

1 set
3 in each set
1 × 3 = 3

46

5

Draw a number line on the easel and number equal intervals from 0 to 15. Have a child draw arcs joining multiples of three.



Have the children practise counting by threes.

Written and Other Activities

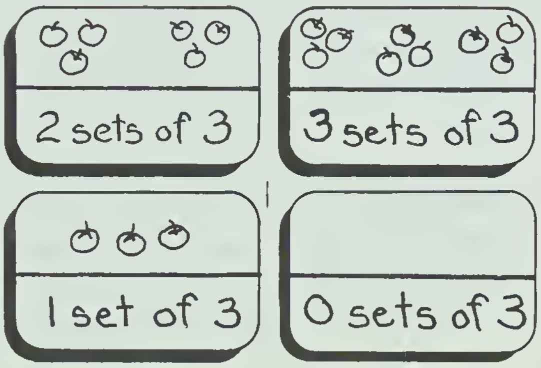
☐

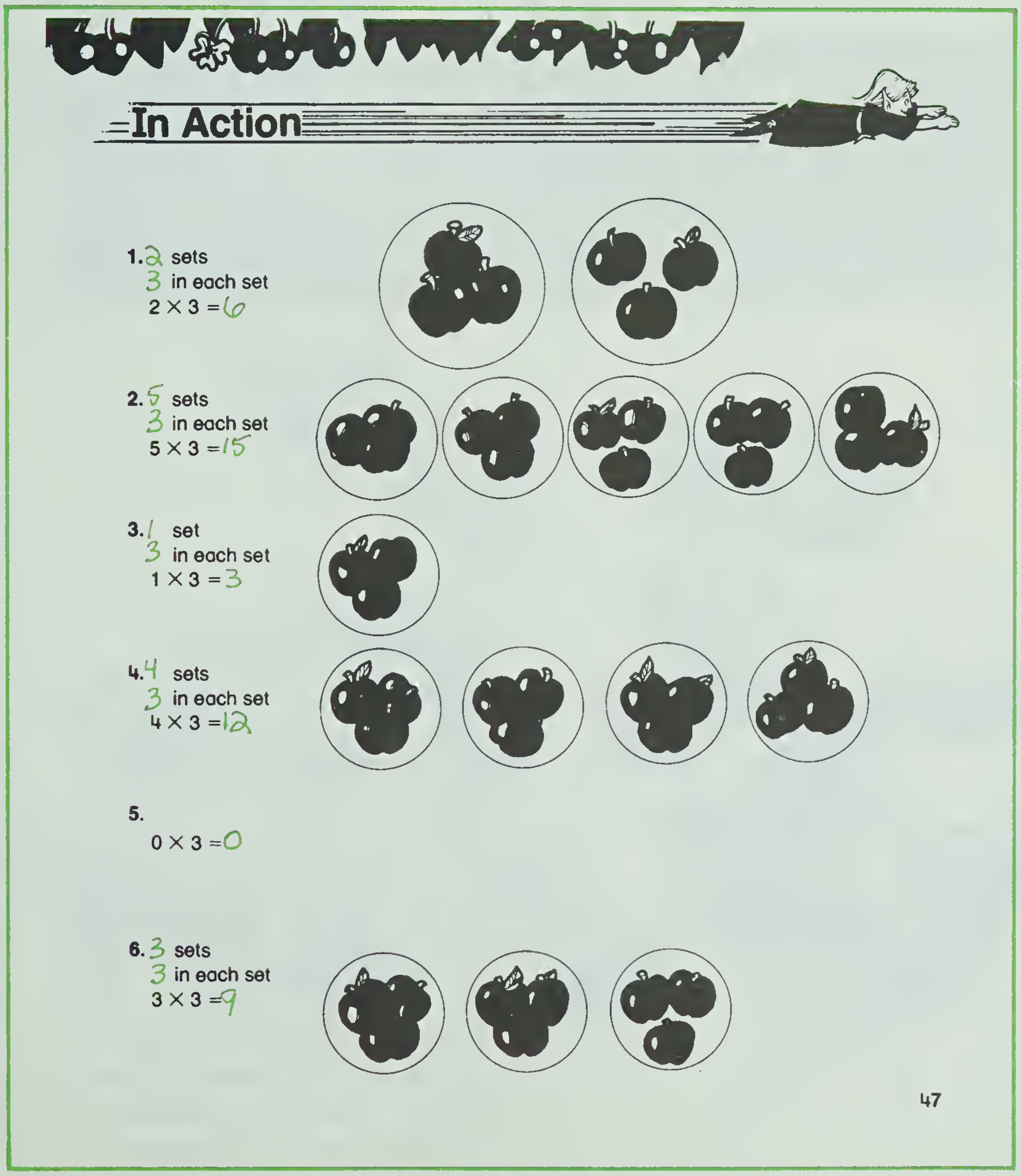
mathways 3, pages 46 and 47

Discuss the examples on page 46 before assigning the In Action exercise.

☐ ☐

Make a set of cards illustrating sets of three.





In Action

1. 2 sets
3 in each set
2 × 3 = 6

2. 5 sets
3 in each set
5 × 3 = 15

3. 1 set
3 in each set
1 × 3 = 3

4. 4 sets
3 in each set
4 × 3 = 12

5.
0 × 3 = 0

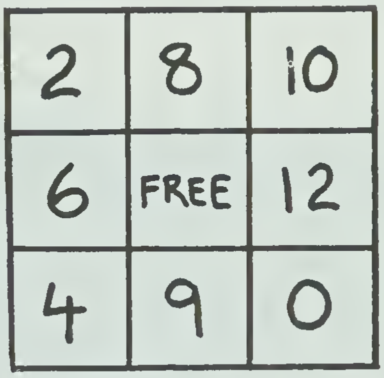
6. 3 sets
3 in each set
3 × 3 = 9

47

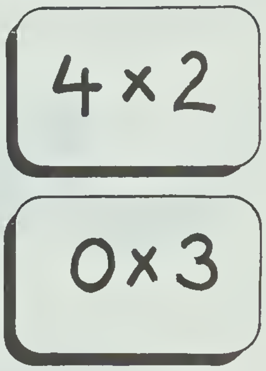
The cards should be large enough that each group member can see them. Show the cards, one at a time, and ask the children to each write a multiplication expression corresponding to each sentence.

☐ ☐ ☐

Provide each child with a 12 cm by 12 cm square of paper. Have the children fold their squares four times to form nine equal regions. Have them print *Free* in their centre squares and record eight of the following numerals in random order, one in each of the remaining squares. *0, 2, 3, 4, 6, 8, 9, 10, 12, 15*



2	8	10
6	FREE	12
4	9	0



Record the multiplication expressions from 0 × 2 to 5 × 2 and from 0 × 3 to 5 × 3 on cards, one per card. Appoint a caller who will draw cards one at a time, and read the expressions aloud. The players cover the products with counters as the expressions are read. The first player to cover a row, column or diagonal is the winner.

Unit 1 Section 5 Lesson 4

Exploring Multiplication and Repeated Addition to 5 × 2

Materials

- for each child
  - – counters
  - – five paper plates

Rationale

Repeated addition can be used to help children understand multiplication by providing another way to find the total for equal groups. Later, children can use repeated addition to find products they need to recall.

Lesson

1

Gather the children around the easel. Write 4 × 2 on the easel. Distribute the paper plates and counters and have each child use the materials to show four sets of two. Ask for the number of sets, the number in each set and the number altogether. Then complete the multiplication sentence on the easel. Introduce the term *product.*

2

Use a child's counters as a display and explain that to find the product, the children can add the number of objects in each group. Pointing to each group in turn, say

Two plus two plus two plus two equals eight.

Write on the easel

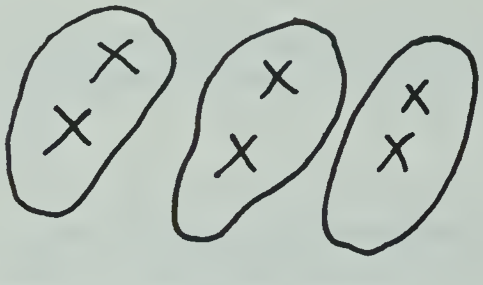
$2 + 2 + 2 + 2 = 8$

3

Repeat steps 1 and 2 for 3 × 2, 1 × 2, 2 × 2, 5 × 2 and 0 × 2.

4

On the easel sketch three sets of two Xs. Loop each set of Xs.



Have each child in the group write the appropriate multiplication and repeated addition sentence.

$3 \times 2 = 6$

$2 + 2 + 2 = 6$

Ask one child to write the two sentences on the easel under the illustration. The other participants can use this as a model to check their own work. Repeat for 1 × 2, 0 × 2, 2 × 2, 4 × 2 and 5 × 2.

5

Introduce the vertical notation by recalling that addition sentences can be written two ways. Show that

$5 \times 2 = 10$ and

$$\begin{array}{r} 2 \\ \times\, 5 \\ \hline 10 \end{array}$$

mean the same.

Written and Other Activities

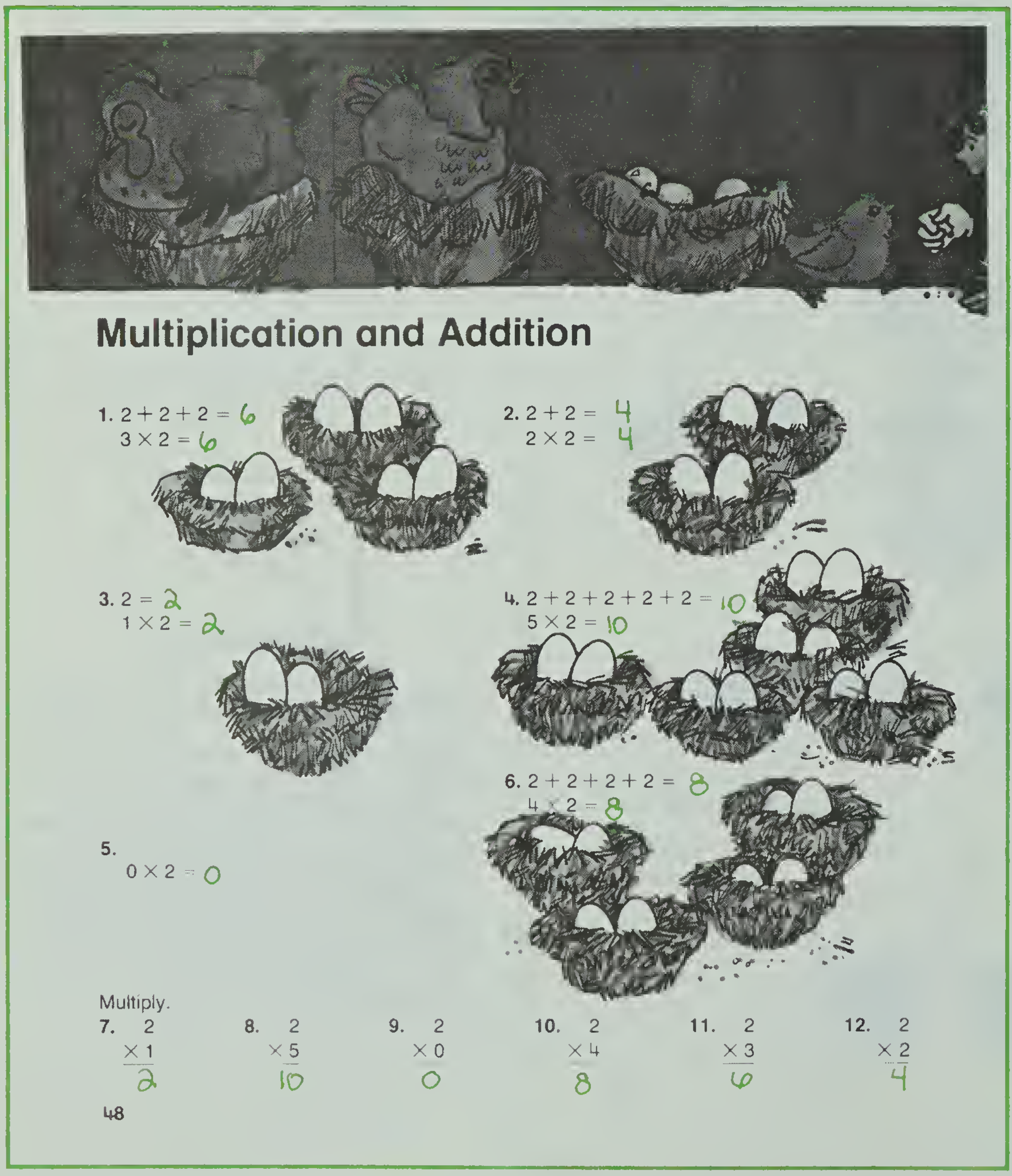
☐

mathways 3, page 48

Have the children use repeated addition instead of counters to find the products they don't remember. Have the children write the addition sentence for the multiplication questions on page 48.

☐ ☐

Have the children draw pictures to illustrate the questions on page 48. They could draw three baskets with two apples each for question 1.



Multiplication and Addition

1. $2 + 2 + 2 = 6$
$3 \times 2 = 6$

2. $2 + 2 = 4$
$2 \times 2 = 4$

3. $2 = 2$
$1 \times 2 = 2$

4. $2 + 2 + 2 + 2 + 2 = 10$
$5 \times 2 = 10$

5. $0 \times 2 = 0$

6. $2 + 2 + 2 + 2 = 8$
$4 \times 2 = 8$

Multiply.

7. $\begin{array}{r} 2 \\ \times 1 \\ \hline 2 \end{array}$ 8. $\begin{array}{r} 2 \\ \times 5 \\ \hline 10 \end{array}$ 9. $\begin{array}{r} 2 \\ \times 0 \\ \hline 0 \end{array}$ 10. $\begin{array}{r} 2 \\ \times 4 \\ \hline 8 \end{array}$ 11. $\begin{array}{r} 2 \\ \times 3 \\ \hline 6 \end{array}$ 12. $\begin{array}{r} 2 \\ \times 2 \\ \hline 4 \end{array}$

48

Unit 1 Section 5 Lesson 5

Exploring Multiplication and Repeated Addition to 5×3

Materials

- die marked 0, 1, 2, 3, 4 and 5
- die marked 2, 2, 2, 3, 3 and 3
- for each child
  - counters
  - five paper plates

Lesson

1

Gather the children around the working area. Write $4 \times 3 = 12$ on the easel. Have each child use paper plates and counters to show four sets of three. Ask for the number of sets, the number in each set and the number altogether. Repeat for the other multiplication sentences, from $0 \times 3 = 0$ to $5 \times 3 = 15$.

2

Write $5 \times 3 = 15$ on the easel. Have each child use counters and paper plates to illustrate the sentence. Recall that addition can be used to find the answer.

three plus three plus three plus three plus three equals 15.

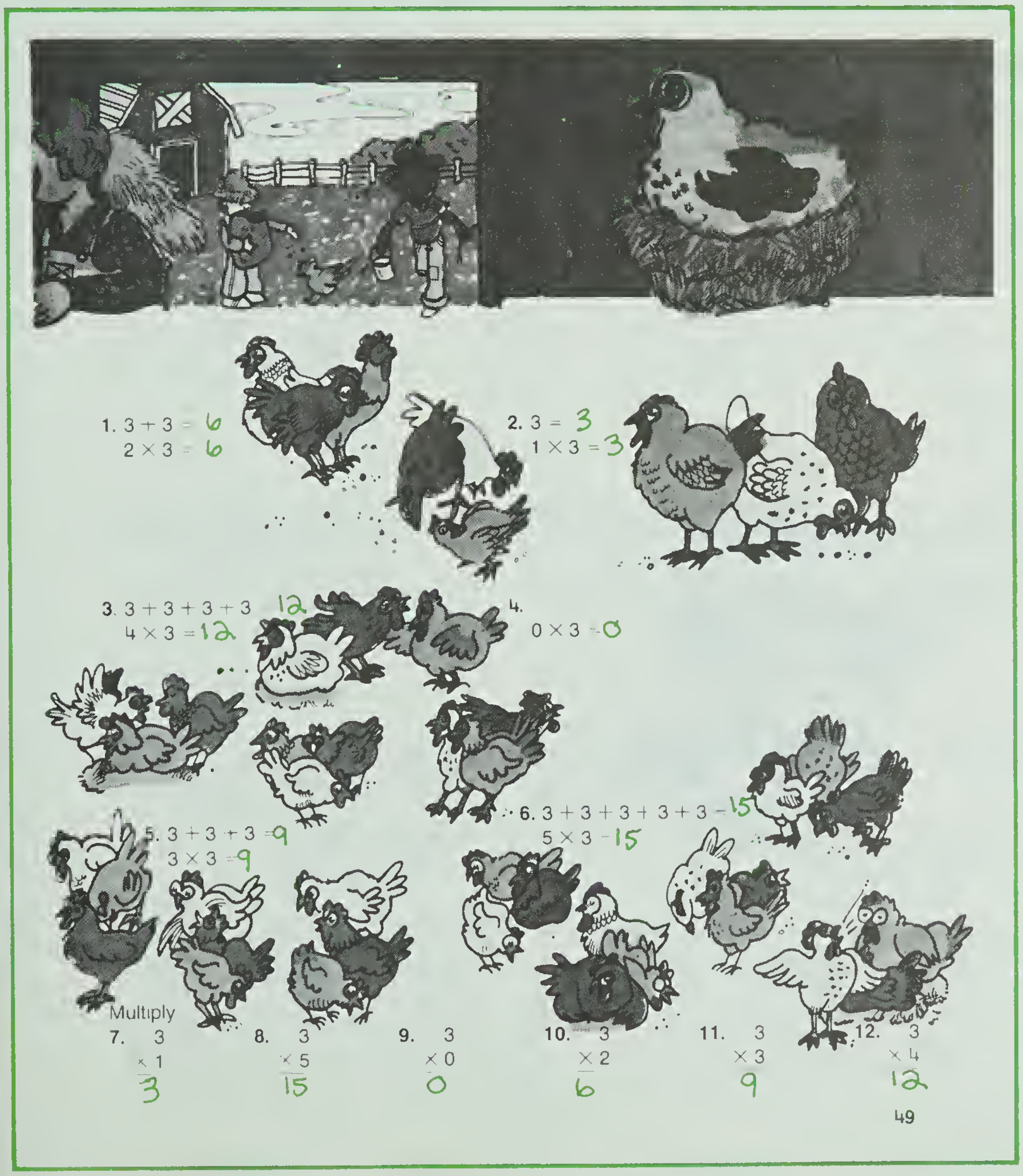
Write on the easel

$3 + 3 + 3 + 3 + 3 = 15$

Repeat for 0×3, 1×3, 2×3, 3×3 and 4×3.

3

Write $2 \times 3 = 6$ on the easel and have a child write the corresponding addition sentence on the easel. Reverse this and write $3 + 3 + 3 + 3 + 3$ on the easel for a child to write the corresponding multiplication sentence. Repeat this for the other multiplication sentences, from $1 \times 3 = 3$ to $5 \times 3 = 15$.



1. $3 + 3 = 6$
$2 \times 3 = 6$

2. $3 = 3$
$1 \times 3 = 3$

3. $3 + 3 + 3 + 3$ 12
$4 \times 3 = 12$

4.
$0 \times 3 = 0$

5. $3 + 3 + 3 = 9$
$3 \times 3 = 9$

6. $3 + 3 + 3 + 3 + 3 = 15$
$5 \times 3 = 15$

Multiply

7. $3 \times 1 = 3$
8. $3 \times 5 = 15$
9. $3 \times 0 = 0$
10. $3 \times 2 = 6$
11. $3 \times 3 = 9$
12. $3 \times 4 = 12$

49

Written and Other Activities

☐

mathways 3, page 49

Remind the children that they can use repeated addition to find the answers. Have the children write the addition sentences for the multiplication questions in the exercises.

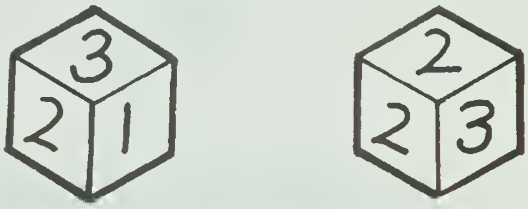
☐ ☐

As soon as the children have a sound understanding of the meaning of multiplication and have had repeated experiences with concrete materials, they should begin to memorize the multiplication facts.

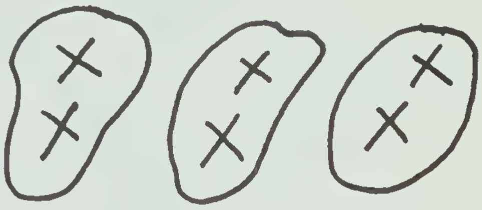
Mark one die 0, 1, 2, 3, 4 and 5.

Mark a second die 2, 2, 2, 3, 3 and 3.

Have one group member roll the dice. All group members record an expression, illustrate the expression, complete the sentence and write the addition sentence. For example



3×2



$3 \times 2 = 6$

$2 + 2 + 2 = 6$

☐ ☐ ☐

mathways 3 Plus Workbook page 14

Unit 1 Section 6 Lesson 1

Exploring Multiplication: Sets of Four, from 0 × 4 to 5 × 4

Materials

- One Hundred Board
- for each child
  - counters
  - five paper plates

Lesson

1

Gather the children around the working area.

Distribute 5 paper plates and 20 counters to each child.

Write 2 × 4 = ☐ on the easel.

How many sets are there?

How many are in each set?

Use your counters and paper plates to show two sets of four.

How many counters are there altogether?

Complete the multiplication sentence on the easel. 2 × 4 = 8.

Repeat this for 0 × 4, 1 × 4, 3 × 4, 4 × 4 and 5 × 4.

2

Draw two circles. Draw four Xs in each circle. Explain that this shows two sets of four.

How many sets are there?

How many are in each set?

How many are there altogether?

Have a child write the corresponding multiplication sentence on the easel.

Repeat this for 3 × 4, 5 × 4, 2 × 4 and 1 × 4.

Write 0 × 4 on the easel. Ask for the number of sets, the number in each set and the product. Establish that for 0 × 4, there are zero sets of four.

Written and Other Activities

☐

mathways 3, page 50

If necessary, have the children use counters to find the products.

☐ ☐

Give the children a great deal of experience counting by twos, threes and fours. At first they may need to consult the wall One Hundred Board, but with practice they should be able to quickly master this task. A more challenging task is to have them count by twos, threes and fours, beginning at a number that is not a multiple of the number by which they are counting.

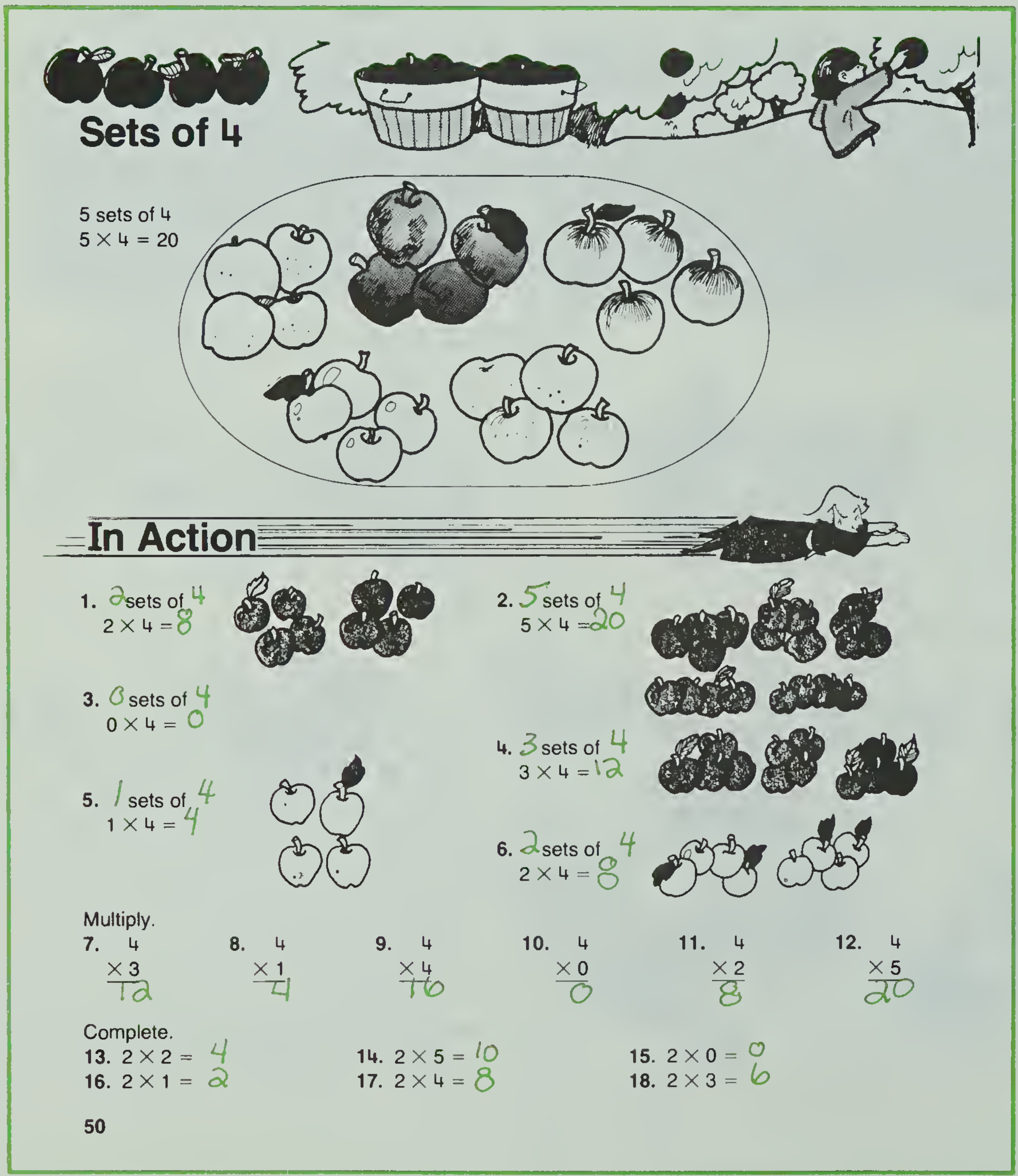
Count by threes. Begin at seven.

Count by fours. Begin at 19.

Have them also count back, beginning both at multiples and at numbers that are not multiples of the number by which they are counting.

☐ ☐ ☐

mathways 3 Practice Masters page 9



Sets of 4

5 sets of 4
5 × 4 = 20

In Action

1. 2 sets of 4
2 × 4 = 8

2. 5 sets of 4
5 × 4 = 20

3. 0 sets of 4
0 × 4 = 0

4. 3 sets of 4
3 × 4 = 12

5. 1 sets of 4
1 × 4 = 4

6. 2 sets of 4
2 × 4 = 8

Multiply.

7. $\begin{array}{r}4\\ \times 3\\ \hline 12\end{array}$ 8. $\begin{array}{r}4\\ \times 1\\ \hline 4\end{array}$ 9. $\begin{array}{r}4\\ \times 4\\ \hline 16\end{array}$ 10. $\begin{array}{r}4\\ \times 0\\ \hline 0\end{array}$ 11. $\begin{array}{r}4\\ \times 2\\ \hline 8\end{array}$ 12. $\begin{array}{r}4\\ \times 5\\ \hline 20\end{array}$

Complete.

13. 2 × 2 = 4 14. 2 × 5 = 10 15. 2 × 0 = 0
16. 2 × 1 = 2 17. 2 × 4 = 8 18. 2 × 3 = 6

50

Unit 1 Section 6 Lesson 2

Exploring Multiplication: Sets of Five, from 0 × 5 to 5 × 5

Materials

- for each child
  - copy of Program Master 24
  - crayons
  - counters
  - paper plates

Lesson

1

Gather the children around the working area. Have four children hold up a hand, fingers and thumb extended.

Ask

How many hands are there?
How many fingers are on each hand?
How many fingers are there altogether?

Have a child write the corresponding multiplication sentence on the easel.

4 × 5 = 20

Repeat the activity for 5 × 5, 2 × 5, 1 × 5 and 3 × 5.

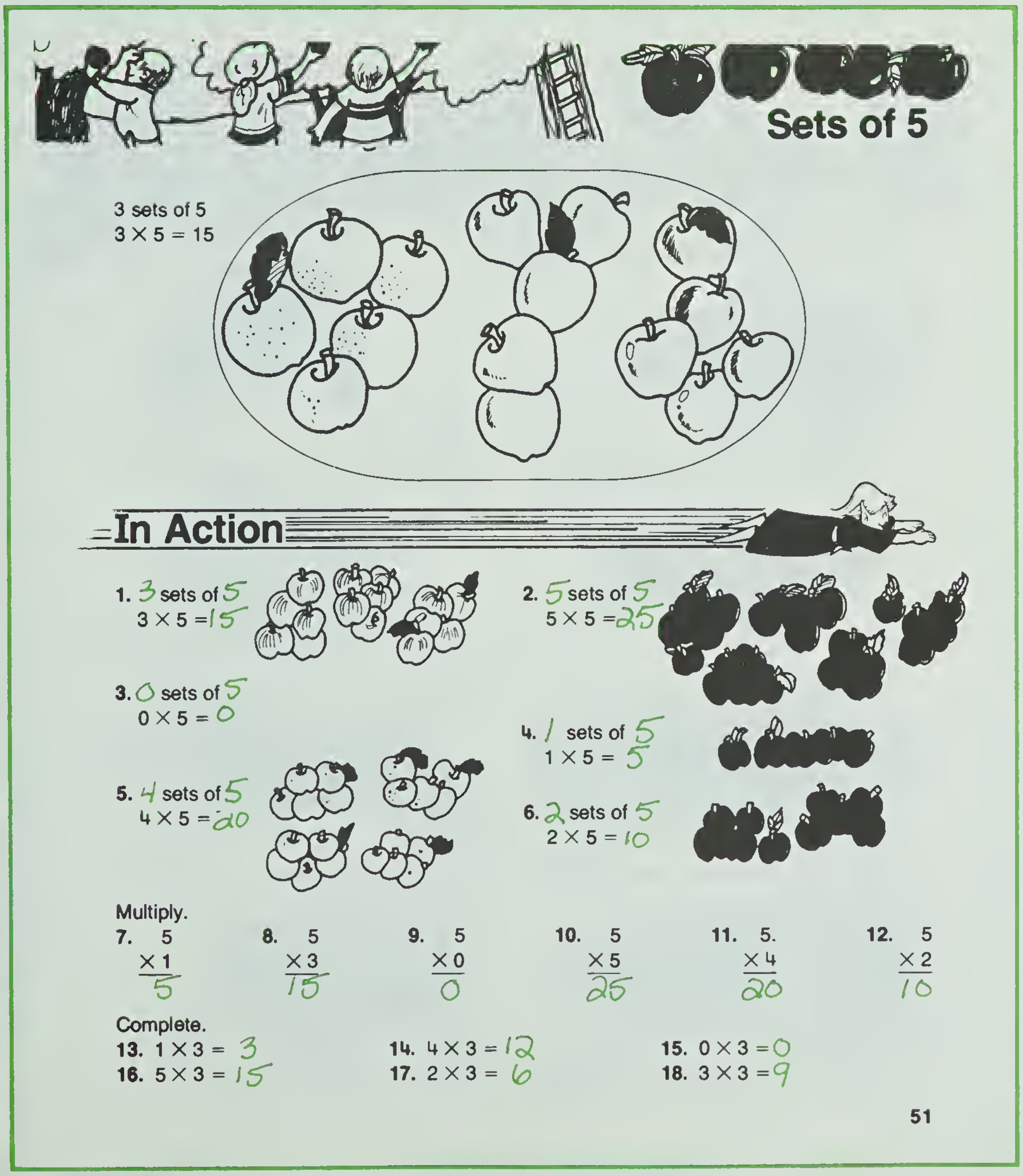
Write on the easel *0 × 5*

Ask

How many hands are there?
How many fingers are on each hand?
How many fingers are there altogether?

2

Have 25 children form as many groups of five as possible. Have a child count the groups and write the numeral on the easel. Have another child count the children and write the numeral on the easel. Have a third child write the corresponding multiplication sentence on the easel. Ask one group of five to move away. Have a child write the multiplication sentence that describes the groups remaining. Have another group move away and repeat. Continue until there are no groups left.



Sets of 5

3 sets of 5
3 × 5 = 15

In Action

1. 3 sets of 5
3 × 5 = 15

2. 5 sets of 5
5 × 5 = 25

3. 0 sets of 5
0 × 5 = 0

4. 1 sets of 5
1 × 5 = 5

5. 4 sets of 5
4 × 5 = 20

6. 2 sets of 5
2 × 5 = 10

Multiply.

7. $\begin{array}{r}5\\ \times 1\\ \hline 5\end{array}$
8. $\begin{array}{r}5\\ \times 3\\ \hline 15\end{array}$
9. $\begin{array}{r}5\\ \times 0\\ \hline 0\end{array}$
10. $\begin{array}{r}5\\ \times 5\\ \hline 25\end{array}$
11. $\begin{array}{r}5.\\ \times 4\\ \hline 20\end{array}$
12. $\begin{array}{r}5\\ \times 2\\ \hline 10\end{array}$

Complete.

13. 1 × 3 = 3
14. 4 × 3 = 12
15. 0 × 3 = 0
16. 5 × 3 = 15
17. 2 × 3 = 6
18. 3 × 3 = 9

51

Ask

How many groups of five are there now?

Write on the easel *0 × 5 = 0* saying

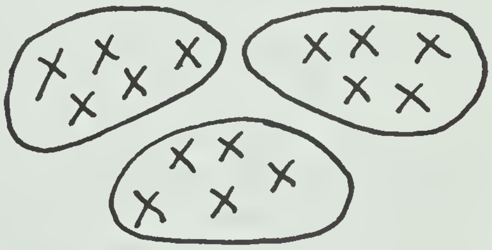
Zero groups of five children equals zero children.

Alternatively, assign a number from one to five to five groups of five children. Ask group one to stand, then group two and so forth. Each time, have the children counted and write the multiplication expression on the easel.

3

Write a multiplication expression on the easel. *3 × 5*

Have the children sketch Xs in loops to illustrate the expression. Have the children write a multiplication sentence under their illustrations.



Written and Other Activities

☐

mathways 3, page 51

Discuss the example shown.

Provide paper plates and counters and have children demonstrate several of the In Action questions before assigning the exercise.

☐ ☐

Distribute copies of Program Master 24 for the children to complete. Since they have not yet multiplied 0 × 0, 0 × 1 or 1 × 1, the children may need to discuss each, illustrating where possible to find the products for these expressions.

☐ ☐ ☐

mathways 3 Plus Workbook page 15

Unit 1 Section 6 Lesson 3

PROBLEM SOLVING

Using Multiplication to Solve Word Problems

Materials

- chairs
- books
- multiplication chart
- counters

Lesson

1

There are three teams with two children on each team.

Ask three sets of two children to demonstrate this. Ask for the multiplication sentence $3 \times 2 = 6$. Use the children on the team as counters. Have a child state in a sentence the number of children on all the teams together. Repeat using other numbers of teams and numbers on each team.

2

There are five chairs with four legs on each chair.

Have the children use chairs in the classroom as counters. Ask for the multiplication sentence $5 \times 4 = 20$ and the number of chair legs altogether. Repeat varying the number of chairs.

3

There are two tables with one book on each.

Use tables and books in the classroom to demonstrate this. Ask for the multiplication sentence $2 \times 1 = 2$ and the number of books altogether. Repeat varying the number of tables and books on each table.

4

There are four wagons with three boxes in each.

Have each child draw a picture to show the wagons and boxes. Ask for the multiplication sentence $4 \times 3 = 12$ and have a child state in a sentence the number of boxes altogether. Repeat varying the number of wagons and boxes.

5

Have the children work in pairs or groups to make up word problems for classmates to solve. Each group can present one or two problems and ask other children to write the multiplication sentences on the easel.

Some children may enjoy writing out multiplication word problems on cards for the activity centre.

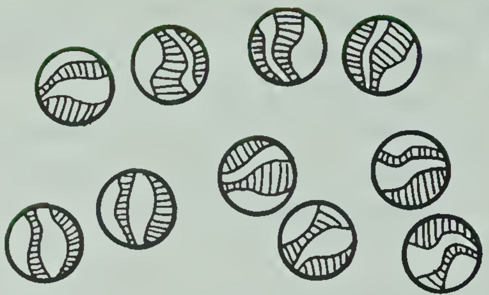
Written and Other Activities

☐

mathways 3, pages 52, 53

Place a quantity of counters in the working area. Ask the children to spend a few moments examining the problems on pages 52 and 53. Have a child read the first problem. Have all the children use counters to show the five shells each containing two peanuts.

Have each child record the multiplication sentence and a concluding statement.



$5 \times 2 = 10$

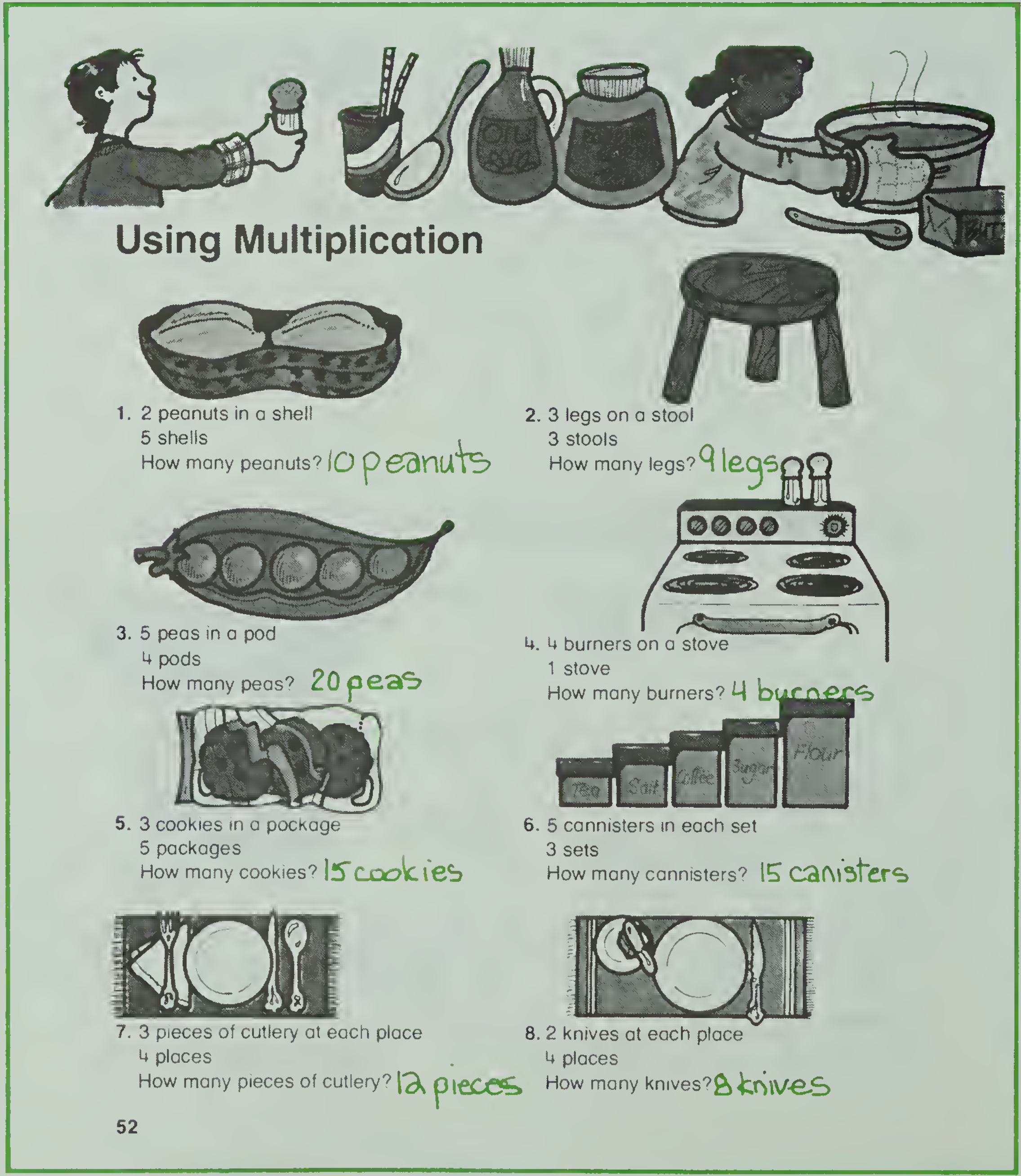
10 peanuts

Repeat for each of the other situations.

☐ ☐

Ask each of the children to create and illustrate a multiplication problem similar to the ones found on pages 52 and 53.

Have the children share their problems in a group situation.



Using Multiplication

1. 2 peanuts in a shell
   5 shells
   How many peanuts? 10 peanuts

2. 3 legs on a stool
   3 stools
   How many legs? 9 legs

3. 5 peas in a pod
   4 pods
   How many peas? 20 peas

4. 4 burners on a stove
   1 stove
   How many burners? 4 burners

5. 3 cookies in a package
   5 packages
   How many cookies? 15 cookies

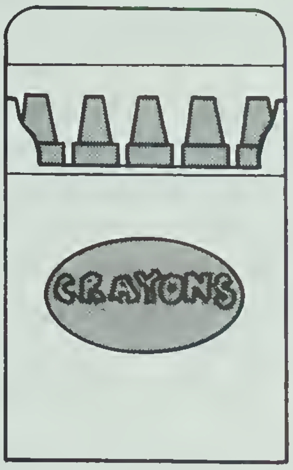
6. 5 cannisters in each set
   3 sets
   How many cannisters? 15 canisters

7. 3 pieces of cutlery at each place
   4 places
   How many pieces of cutlery? 12 pieces

8. 2 knives at each place
   4 places
   How many knives? 8 knives

52

5 crayons in a box



3 boxes
How many crayons?

☐ ☐ ☐

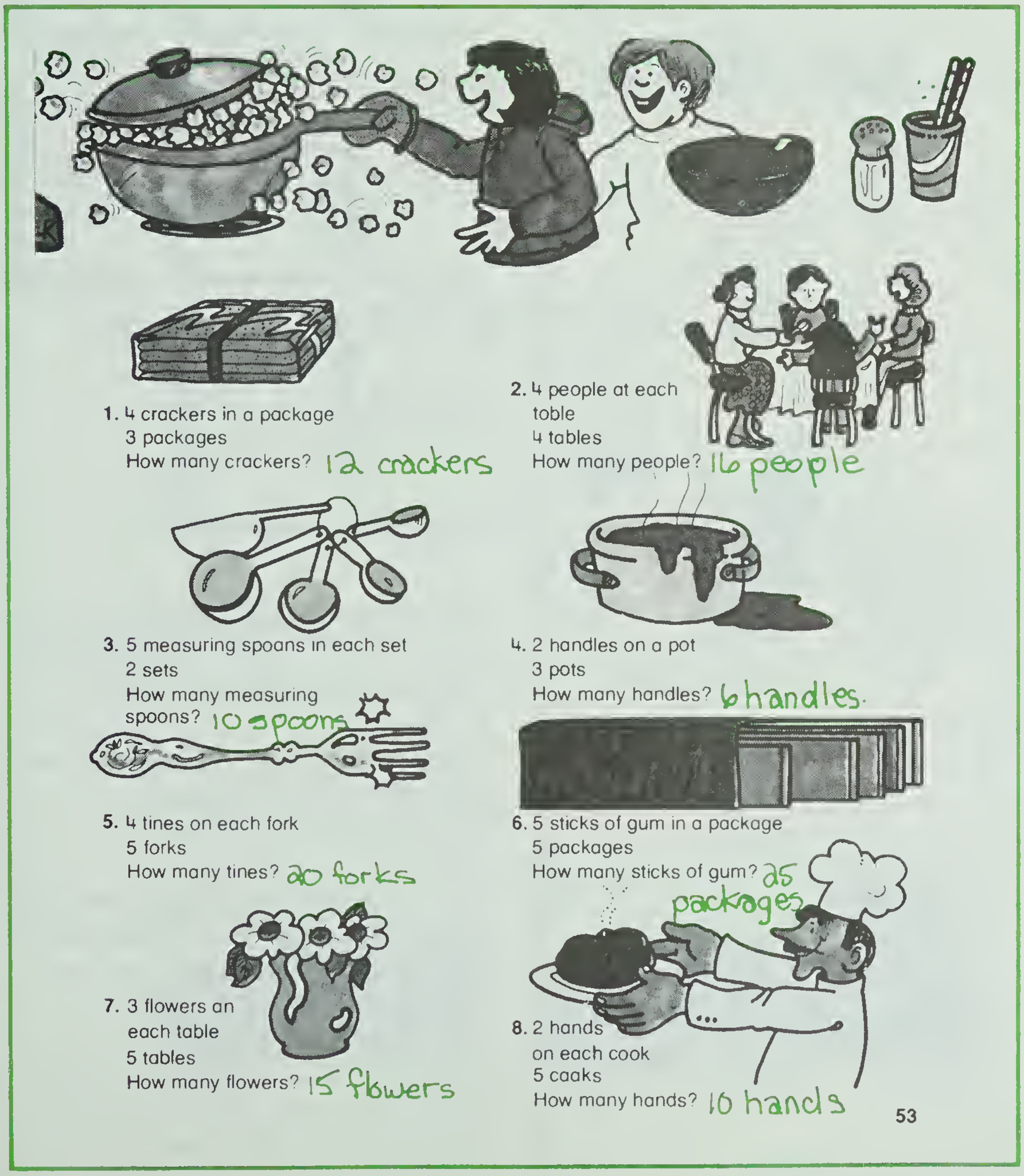
For more practice, alter the customary multiplication chart by trying this format.

X	3	5	0	1	4
2					
5					
1					
4					
3					

☐ ☐ ☐ ☐

Have the children complete the following multiplication patterns.

0, 2, 4, ___, ___, 10
0, 3, 6, ___, ___, ___
0, 4, 8, ___, ___, ___
0, 5, 10, ___, ___, ___
___, ___, 6, 9, 12, ___
___, 4, ___, 12, 16, ___
___, ___, ___, 15, 20, 25



1. 4 crackers in a package
3 packages
How many crackers? 12 crackers

2. 4 people at each table
4 tables
How many people? 16 people

3. 5 measuring spoons in each set
2 sets
How many measuring spoons? 10 spoons

4. 2 handles on a pot
3 pots
How many handles? 6 handles.

5. 4 tines on each fork
5 forks
How many tines? 20 forks

6. 5 sticks of gum in a package
5 packages
How many sticks of gum? 25 packages

7. 3 flowers on each table
5 tables
How many flowers? 15 flowers

8. 2 hands on each cook
5 cooks
How many hands? 10 hands

53

Unit 1 Section 6 Lesson 4

Exploring Multiplication: Repeated Addition to 5 × 5

Materials

- number line
- *Concentration* cards, *see* ☐ ☐
- for each child
  - blank cards to make a personal set of flash cards

Lesson

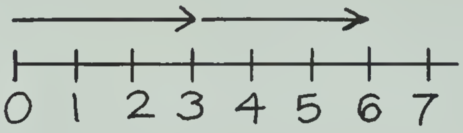
1

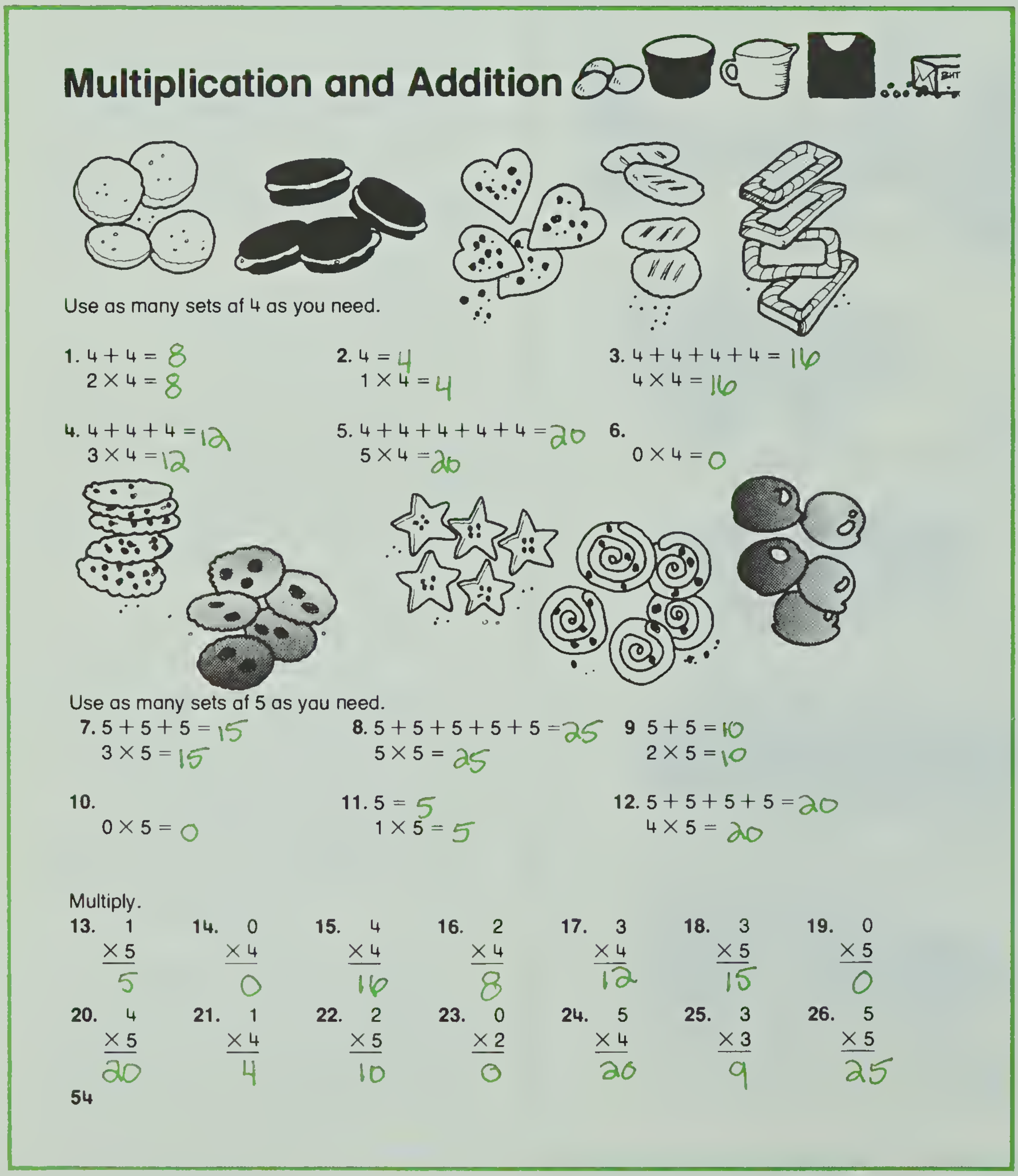
Gather the children into the working area. Write *4 + 4 + 4 + 4* on the easel and ask for the sum. Then have a child write the corresponding multiplication sentence on the easel. Repeat this for the other multiplication expressions from 1 × 4 through 5 × 4 and 1 × 5 through 5 × 5.

2

Children can show some multiplication questions on a number line on the easel. The second factor indicates the number of units for each arrow and the first factor indicates the number of arrows. This helps children understand multiplication, and it also enables them to find products.

2 × 3 = 6





Multiplication and Addition

Use as many sets of 4 as you need.

1. 4 + 4 = 8
2 × 4 = 8

2. 4 = 4
1 × 4 = 4

3. 4 + 4 + 4 + 4 = 16
4 × 4 = 16

4. 4 + 4 + 4 = 12
3 × 4 = 12

5. 4 + 4 + 4 + 4 + 4 = 20
5 × 4 = 20

6. 0 × 4 = 0

Use as many sets of 5 as you need.

7. 5 + 5 + 5 = 15
3 × 5 = 15

8. 5 + 5 + 5 + 5 + 5 = 25
5 × 5 = 25

9 5 + 5 = 10
2 × 5 = 10

10. 0 × 5 = 0

11. 5 = 5
1 × 5 = 5

12. 5 + 5 + 5 + 5 = 20
4 × 5 = 20

Multiply.

13.	14.	15.	16.	17.	18.	19.
1	0	4	2	3	3	0
× 5	× 4	× 4	× 4	× 4	× 5	× 5
5	0	16	8	12	15	0

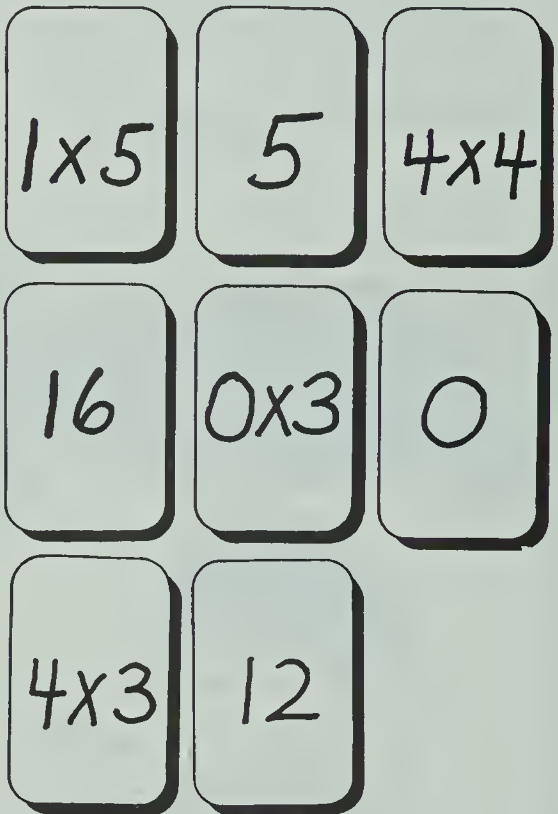
20.	21.	22.	23.	24.	25.	26.
4	1	2	0	5	3	5
× 5	× 4	× 5	× 2	× 4	× 3	× 5
20	4	10	0	20	9	25

54

Written and Other Activities

☐
mathways 3, page 54

☐ ☐
Adapt the game of *Concentration*, described in the teacher's notes for *mathways* page 17, for multiplication. On one set of 12 cards write multiplication expressions. On a second set write the products for the expressions. Here are some sample cards.



Mix the cards, turn them face down in an array and play the game, following the usual *Concentration* rules.

☐ ☐ ☐
Have children, working in pairs, ask each other for the products of multiplication expressions.

☐ ☐ ☐ ☐
Have each child prepare a personal set of flash cards. On one side of a card a multiplication expression is written, and on the reverse side is the appropriate product. There are many uses for such a deck; the owner can practise facts, can take them home for use with interested adults, and so on.

Unit 1 Section 6 Lesson 5

Exploring Multiplication: Sets of One, from 0×1 to 5×1

Materials

- counters
- paper plates

Rationale

Multiplication with one as a factor requires special attention: children must have a firm grasp of the concept of a set of one.

Lesson

1

Seat the children around the working area.

Three children went to the party.
Each child took one present.
How many presents were there?

Write the answer and the multiplication sentence on the easel.

$3 \times 1 = 3$

Repeat this for 0×1, 1×1, 2×1, 4×1 and 5×1.

2

Give five paper plates and five counters to each child.

Show three sets of one.
How many counters are there altogether?
Show five sets of one.
How many counters are there altogether?

Repeat for zero sets of one, two sets of one and four sets of one.

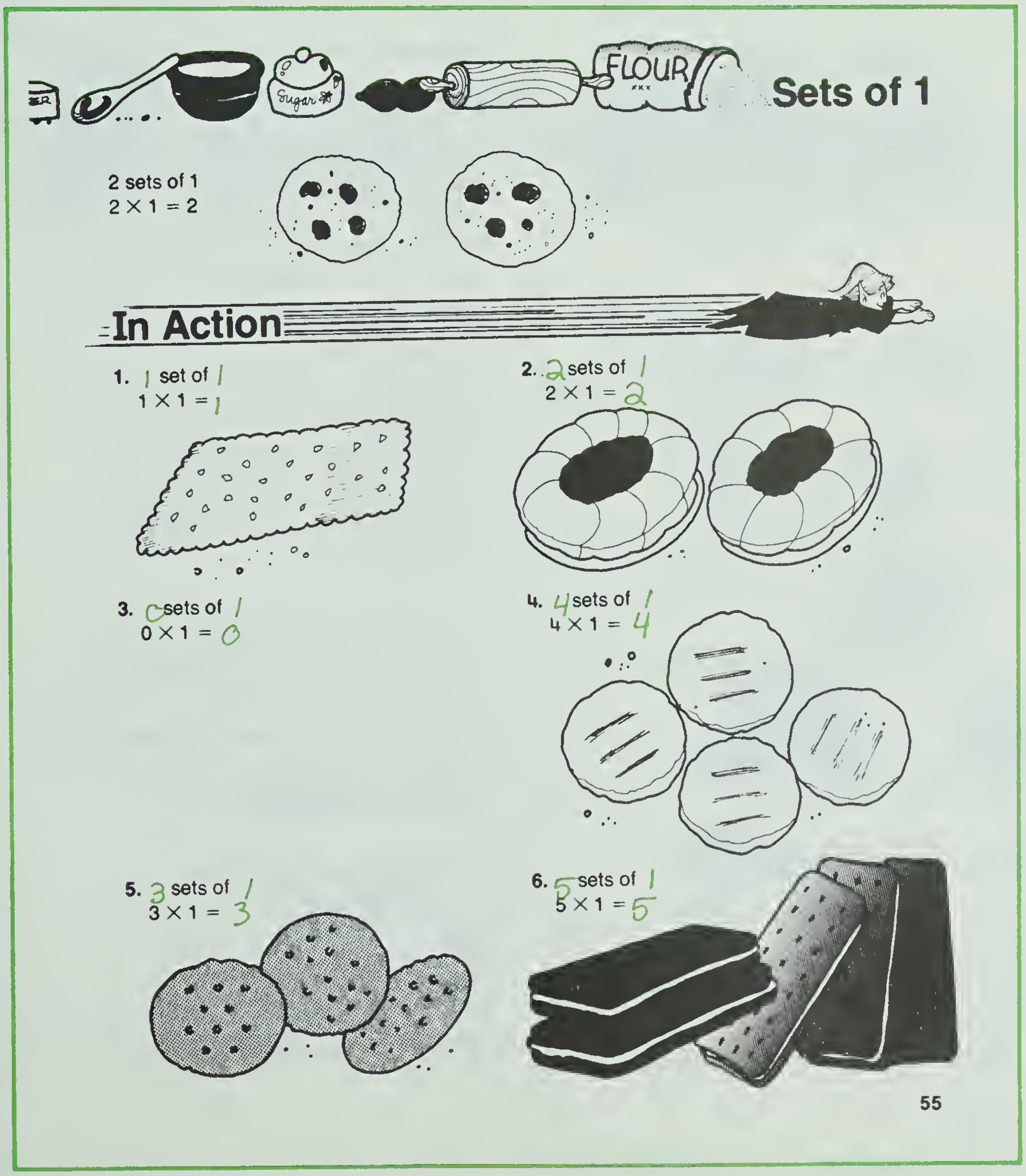
3

Place one counter on each of five paper plates to show 5×1. Ask for the number of sets, the number of counters in each set and the number of counters altogether. Point out that the number of counters altogether is the same as the number of paper plates because each paper plate has one counter. Have a child write the corresponding addition and multiplication sentences on the easel.

$1 + 1 + 1 + 1 + 1 = 5$

$5 \times 1 = 5$

Repeat this for the multiplication expressions from 0×1 through 4×1.



Sets of 1

2 sets of 1
$2 \times 1 = 2$

In Action

1. 1 set of 1
$1 \times 1 = 1$

2. 2 sets of 1
$2 \times 1 = 2$

3. 0 sets of 1
$0 \times 1 = 0$

4. 4 sets of 1
$4 \times 1 = 4$

5. 3 sets of 1
$3 \times 1 = 3$

6. 5 sets of 1
$5 \times 1 = 5$

55

Written and Other Activities

☐

mathways 3, page 55

☐ ☐

To reinforce the concept of sets of one, the children can illustrate several of the questions on page 55.

☐ ☐ ☐

Divide the class into small groups and have each group list as many examples of sets of one as they can. Display the sets for all the groups to read.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 10

Section 7 Lesson 1

Exploring Division: Finding the Number of Equal Sets

Materials

- for each child
  - 15 counters

Rationale

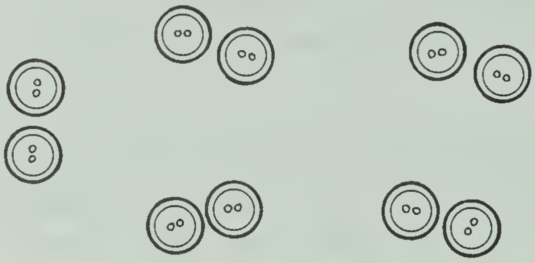
Although many children will have had some readiness for division in Grade Two, it is essential at this introductory stage to provide for a great deal of practice in separating objects into equal sets. As with addition, subtraction and multiplication, mastery of division is based on three stages: working with concrete materials to show how a set of objects is separated; using concrete materials to discover division facts several times; frequent review of division facts to maintain what has been learned.

Lesson

1

Seat the children around the working area and distribute 15 counters to each child. Have the children count out 10 counters and use them to make sets of two.

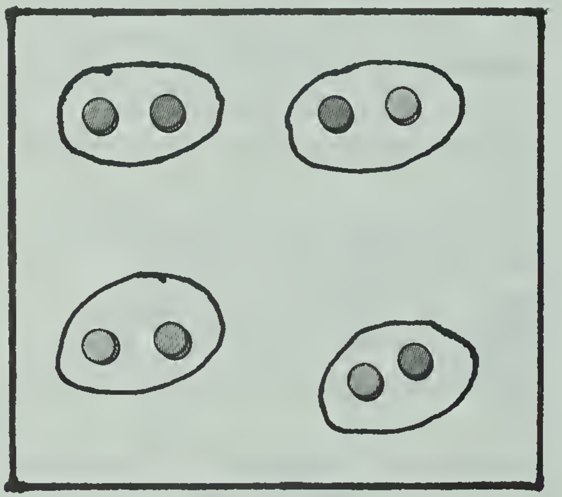
Use 10 counters.
Make as many sets of two as you can.
How many counters did you use?
How many counters are in each set?
How many sets did you make?



Repeat, using other examples:
15 counters, five in each set
four counters, one in each set
six counters, three in each set

2

Draw eight counters on the easel. Show sets by looping four sets of two counters.



Now it's your turn to draw counters.
Draw eight counters on your paper.
Loop a set of two counters.
Loop another set of two.
Keep on looping sets of two until all the counters are looped.

Repeat, having the children illustrate the following sets:
four counters, two in each set
three counters, one in each set
nine counters, three in each set

Some children may need to be instructed to keep their illustrations very simple.

3

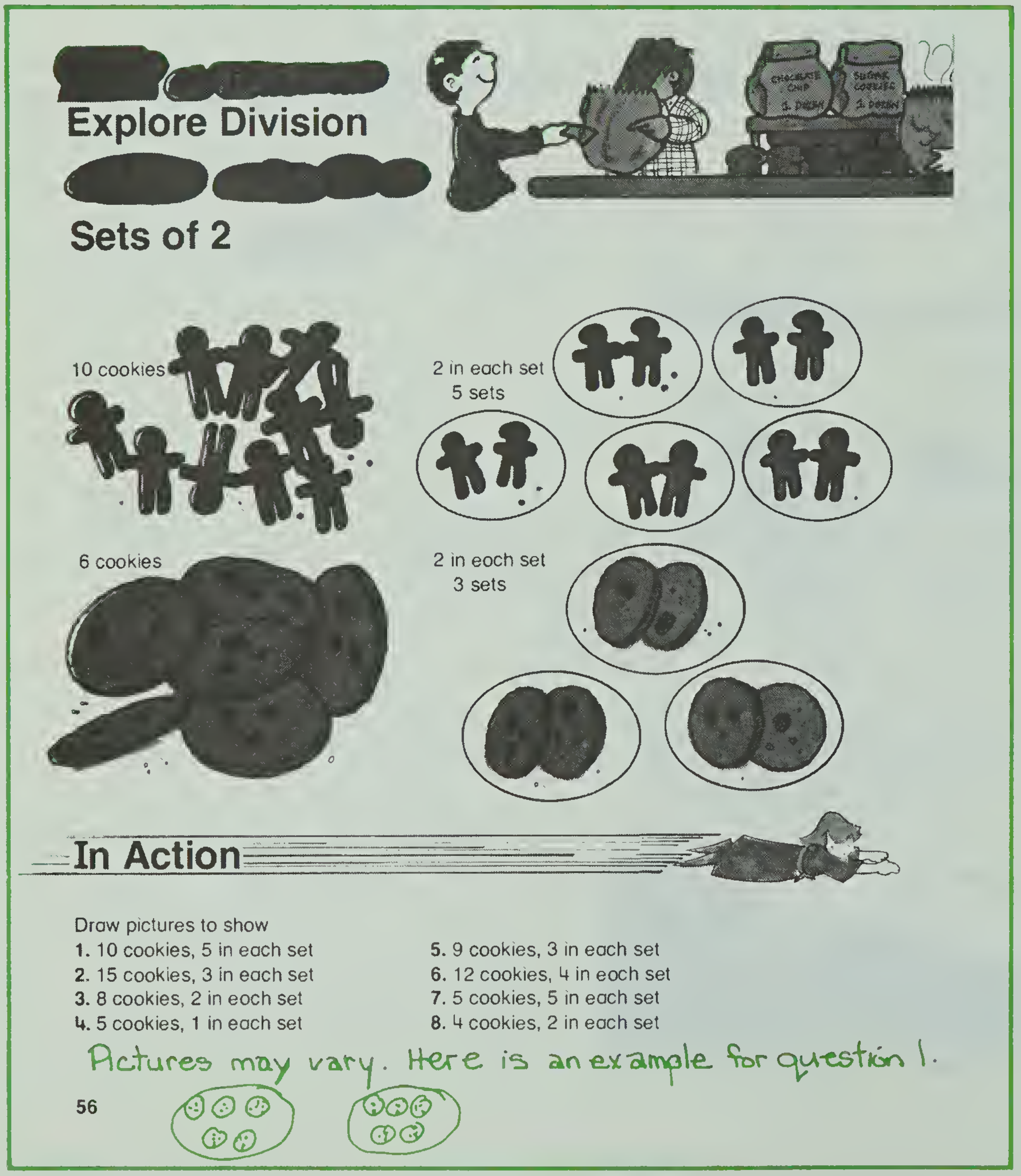
Tell the children that separating a group of objects into equal sets is called division. Then give a series of instructions such as the following:
Take eight counters. Divide them into sets of four counters.

Written and Other Activities

☐

mathways 3, page 56

Before assigning the In Action exercise, discuss the examples.



Explore Division

Sets of 2

In Action

Draw pictures to show
1. 10 cookies, 5 in each set
2. 15 cookies, 3 in each set
3. 8 cookies, 2 in each set
4. 5 cookies, 1 in each set
5. 9 cookies, 3 in each set
6. 12 cookies, 4 in each set
7. 5 cookies, 5 in each set
8. 4 cookies, 2 in each set

Pictures may vary. Here is an example for question 1.

56

Unit 1 Section 7 Lesson 2

Dividing to 10 ÷ 2: Sets of Two; the Symbol ÷

Materials

- for each child
  - counters
  - copy of Program Master 3
  - pair of scissors
  - paper

Lesson

1

Seat the children around the working area and distribute counters. Instruct the children as follows:

Show a group of eight counters.
Divide the counters into sets of two.

Ask

How many counters are there altogether?
How many counters are in each set?
How many sets of counters are there?

Write the corresponding division sentence on the easel,

8 ÷ 2 = 4

saying

Eight divided by two equals four.

Explain the symbol. Then have children take turns explaining the sentence as follows:

Eight counters are divided into sets of two counters.
There are four sets.
There are four sets of two counters in a group of eight counters.

Repeat the procedure for 2 ÷ 2, 4 ÷ 2, 6 ÷ 2 and 10 ÷ 2.

2

Give each child a piece of paper.

Please draw four Xs on your paper.
Loop as many sets of two as you can.
How many sets of Xs did you loop?

Write the division sentence on the easel.

4 ÷ 2 = 2
There are four Xs.
There are two in each set.
There are two sets.

Point to the corresponding numbers in the sentence as it is explained.

Repeat the procedure for 10 ÷ 2, 8 ÷ 2, 6 ÷ 2 and 2 ÷ 2

3

Have the children count back by twos.

Written and Other Activities

☐

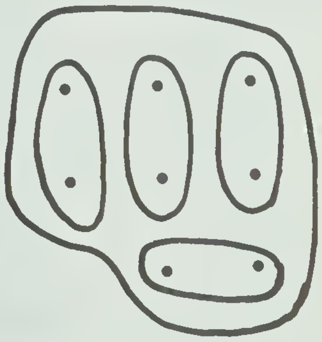
mathways 3, page 57

Allow children to use counters to do the questions if they wish.

☐ ☐

Give each child a copy of Program Master 3. Have them do exercises such as

Cut out eight dots. Loop all the sets of two dots.

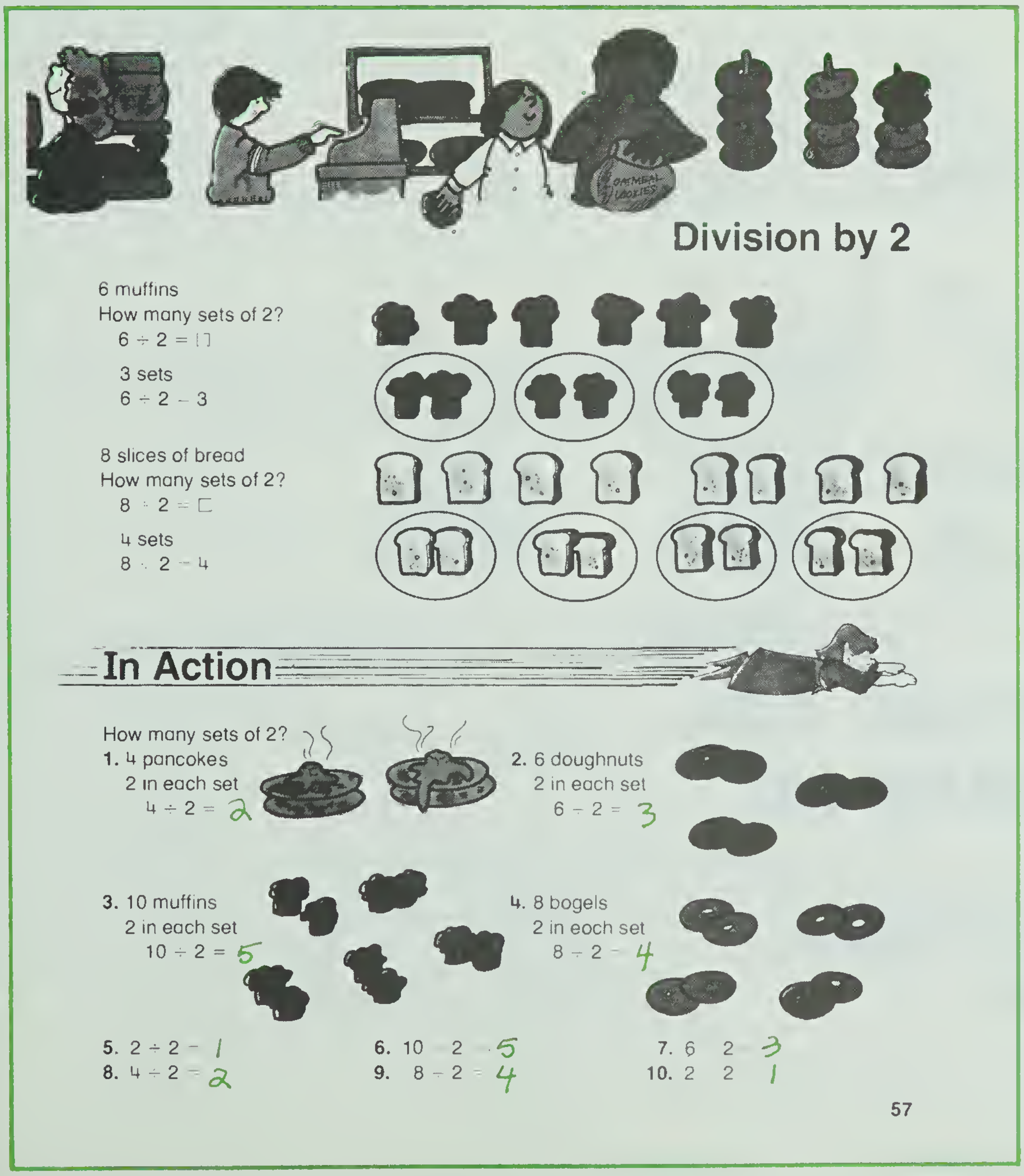


8÷2=4

☐ ☐ ☐

Have the children draw and loop Xs to illustrate the following:

6 ÷ 2
8 ÷ 2
10 ÷ 2
4 ÷ 2
2 ÷ 2



Division by 2

6 muffins
How many sets of 2?
6 ÷ 2 = ☐
3 sets
6 ÷ 2 = 3

8 slices of bread
How many sets of 2?
8 ÷ 2 = ☐
4 sets
8 ÷ 2 = 4

In Action

How many sets of 2?

1. 4 pancakes
2 in each set
4 ÷ 2 = 2

2. 6 doughnuts
2 in each set
6 ÷ 2 = 3

3. 10 muffins
2 in each set
10 ÷ 2 = 5

4. 8 bagels
2 in each set
8 ÷ 2 = 4

5. 2 ÷ 2 = 1
6. 10 ÷ 2 = 5
7. 6 ÷ 2 = 3
8. 4 ÷ 2 = 2
9. 8 ÷ 2 = 4
10. 2 ÷ 2 = 1

57

Unit 1 Section 7 Lesson 3

Dividing Groups of Objects into Sets of Three, from 3 ÷ 3 to 18 ÷ 3

Materials

- for each child
  - 18 counters
  - paper

Lesson

1

Seat the children around the working area.

Give each child 18 counters.

Take six counters.

Make sets with three counters each.

How many sets are there?

Write on the easel.

6 ÷ 3 = 2

Six divided by three equals two.

When six counters are divided into sets of three there are two sets.

There are two sets of three contained in six.

Repeat this activity for 12 ÷ 3, 9 ÷ 3, 3 ÷ 3, 18 ÷ 3 and 15 ÷ 3.

2

Give each child a piece of paper

Please draw 12 Xs on your paper.

Loop as many sets of three as you can.

How many sets of Xs did you loop?

What division sentence can we write?

Write the sentence on the easel.

12 ÷ 3 = 4

There are 12 Xs.

There are three in each set.

There are four sets.

Point to the corresponding numbers in the sentence as it is explained.

Please explain the sentence for us again, Joel.

Repeat the procedure for 3 ÷ 3, 6 ÷ 3, 9 ÷ 3 and 15 ÷ 3.

Written and Other Activities

☐

mathways 3, page 58

☐ ☐

Have the children illustrate some of the questions on page 58.

☐ ☐ ☐

Divide the children into small groups and have each child in a group explain questions 7 through 12. For example, question 7 can be explained as 15 tomatoes, three tomatoes in each basket, five baskets of tomatoes.

☐ ☐ ☐ ☐

As enrichment, have children relate division to repeated subtraction. The number of subtractions shows the quotient.

12 ÷ 3
12 − 3 = 9
9 − 3 = 6
6 − 3 = 3
3 − 3 = 0
12 ÷ 3 = 4

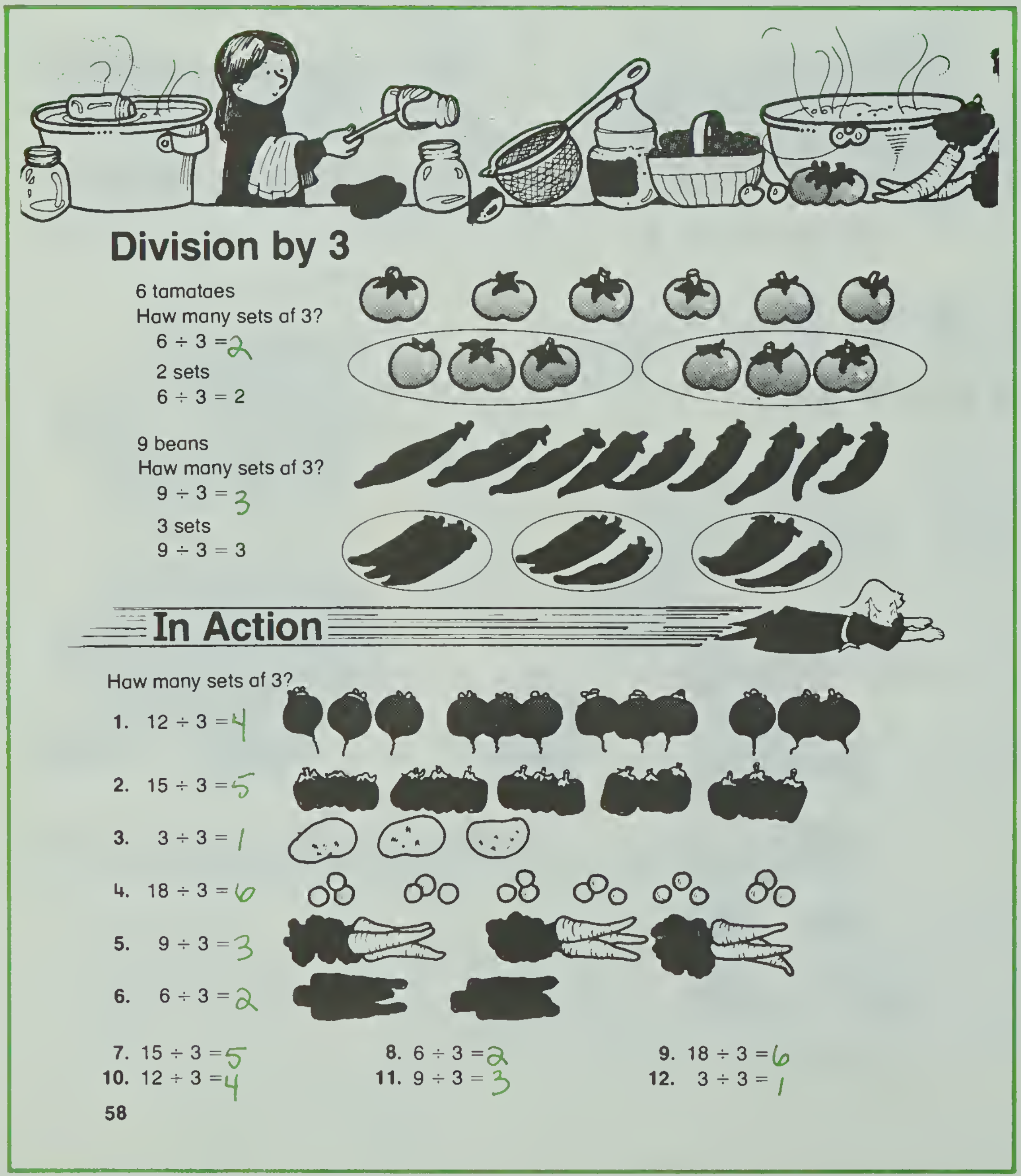
☐ ☐ ☐ ☐ ☐

Have the children draw and loop Xs to illustrate the following:

12 ÷ 3
15 ÷ 3
3 ÷ 3
6 ÷ 3
9 ÷ 3

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 16



Division by 3

6 tomatoes
How many sets of 3?
6 ÷ 3 = 2
2 sets
6 ÷ 3 = 2

9 beans
How many sets of 3?
9 ÷ 3 = 3
3 sets
9 ÷ 3 = 3

In Action

How many sets of 3?

1. 12 ÷ 3 = 4
2. 15 ÷ 3 = 5
3. 3 ÷ 3 = 1
4. 18 ÷ 3 = 6
5. 9 ÷ 3 = 3
6. 6 ÷ 3 = 2

7. 15 ÷ 3 = 5
8. 6 ÷ 3 = 2
9. 18 ÷ 3 = 6
10. 12 ÷ 3 = 4
11. 9 ÷ 3 = 3
12. 3 ÷ 3 = 1

58

Unit 1 Section 7 Lesson 4

Dividing Groups of Objects into Sets of Four, from 4 ÷ 4 to 20 ÷ 4

Materials

- for each child
  - 20 counters
  - number line
  - paper

Lesson

1

Seat the children around the working area and distribute counters. Write $12 \div 4$ on the easel.

How many counters will be divided into sets?

Then have all the children show 12 counters.

How many counters will be in each set?

Have the children make sets of four with their counters.

How many sets of four are there?

Complete the division sentence on the easel and ask a few children to explain the division sentence in their own words. Establish that when 12 counters are divided in sets of four, there are three sets of counters. Repeat this for 16 ÷ 4, 8 ÷ 4, 20 ÷ 4 and 4 ÷ 4.

2

Distribute sheets of paper. Write a division expression on the easel.

$15 \div 3$

Draw Xs and loop them in sets to show the meaning of this division expression.

Allow the children to work quietly for a few moments.

How many Xs did you draw, Carla?
How many Xs did you loop each time?
How many sets did you loop?

Complete the division sentence on the easel.

$15 \div 3 = 5$

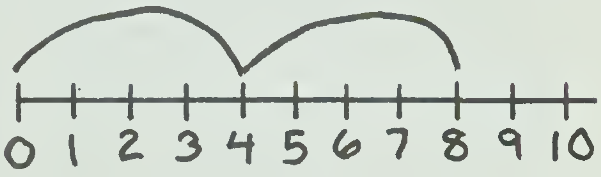
Repeat for several division expressions.

3

A number line drawn on the easel can be used to show division. Write on the easel

$8 \div 4$

Start at eight and draw each arrow or arc four units long.



The number of arrows (or arcs) shows the number of fours in eight.

$8 \div 4 = 2$

Have the children illustrate division sentences on the number line.

Written and Other Activities

☐

mathways 3, page 59

Have the children illustrate some of the examples on page 59.

☐ ☐

Have the children draw number lines to show some of the questions on page 59 and display each number line with the corresponding division sentence written under it.

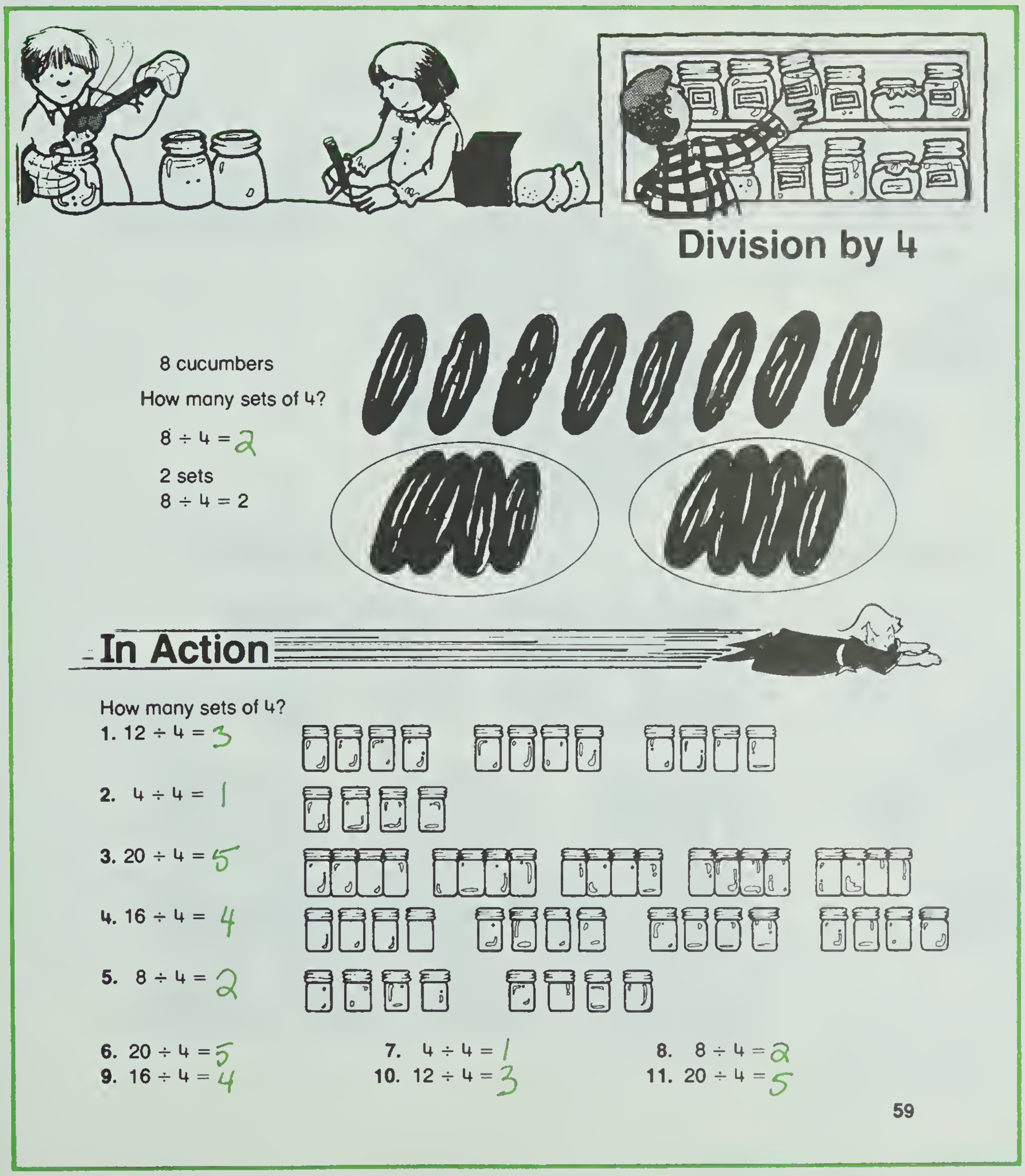
Children can use the number lines to find the answers for these questions and for questions on the following pages.

☐ ☐ ☐

Number lines can be used as described above for an activity for two children. Display a number line from 0 to 20. One child reads a division exercise from *mathways 3* page 59, and the other draws arcs on the number line to find the answer.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 11



Division by 4

8 cucumbers

How many sets of 4?

8 ÷ 4 = 2

2 sets

8 ÷ 4 = 2

In Action

How many sets of 4?

1. 12 ÷ 4 = 3
2. 4 ÷ 4 = 1
3. 20 ÷ 4 = 5
4. 16 ÷ 4 = 4
5. 8 ÷ 4 = 2

6. 20 ÷ 4 = 5
7. 4 ÷ 4 = 1
8. 8 ÷ 4 = 2
9. 16 ÷ 4 = 4
10. 12 ÷ 4 = 3
11. 20 ÷ 4 = 5

59

Unit 1 Section 7 Lesson 5

Dividing Groups of Objects into Sets of Five, from 5 ÷ 5 to 25 ÷ 5

Materials

- catalogues
- for each child
  - 25 counters
  - pair of scissors
  - glue
  - construction paper

Lesson

1

Seat the children around the working area. Give each child 25 counters. Write *10 ÷ 5* on the easel and have each child select the number of counters needed for the division.

How many counters are being divided into sets?

How many counters will there be in each set?

How many sets are there?

Repeat this for 25 ÷ 5, 20 ÷ 5, 15 ÷ 5 and 5 ÷ 5.

2

Have each child cut pictures of 5, 10, 15, 20 or 25 objects from a catalogue, glue them on a piece of construction paper, loop sets of five, and write the division sentence shown. These can be displayed to reinforce the concept of division and as a reference for the division facts when dividing by fives.

Written and Other Activities

☐

mathways 3, page 60

☐ ☐

A small group of children can sit in a circle to play this game. They begin at 28 and count back by ones to one, with each child in turn saying a number. For each number that is a multiple of five, the child claps instead of saying the number. Whenever a child makes a mistake, the group begins at 28 again. Challenge the group to try to count to one as many times as possible.

☐ ☐ ☐

The above activity can be reversed for a greater challenge. The children say the numbers that are multiples of five and clap for the other numbers.

☐ ☐ ☐ ☐

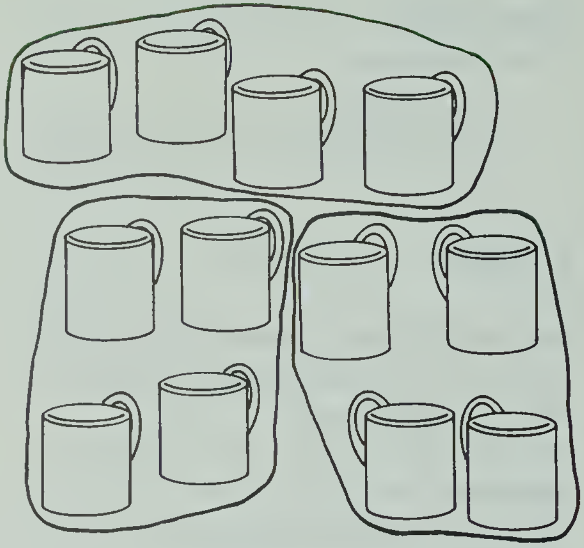
Write a series of directions such as the following on the easel.

Draw 20 objects.
Loop sets of 5.

Draw 12 objects.
Loop sets of 4.

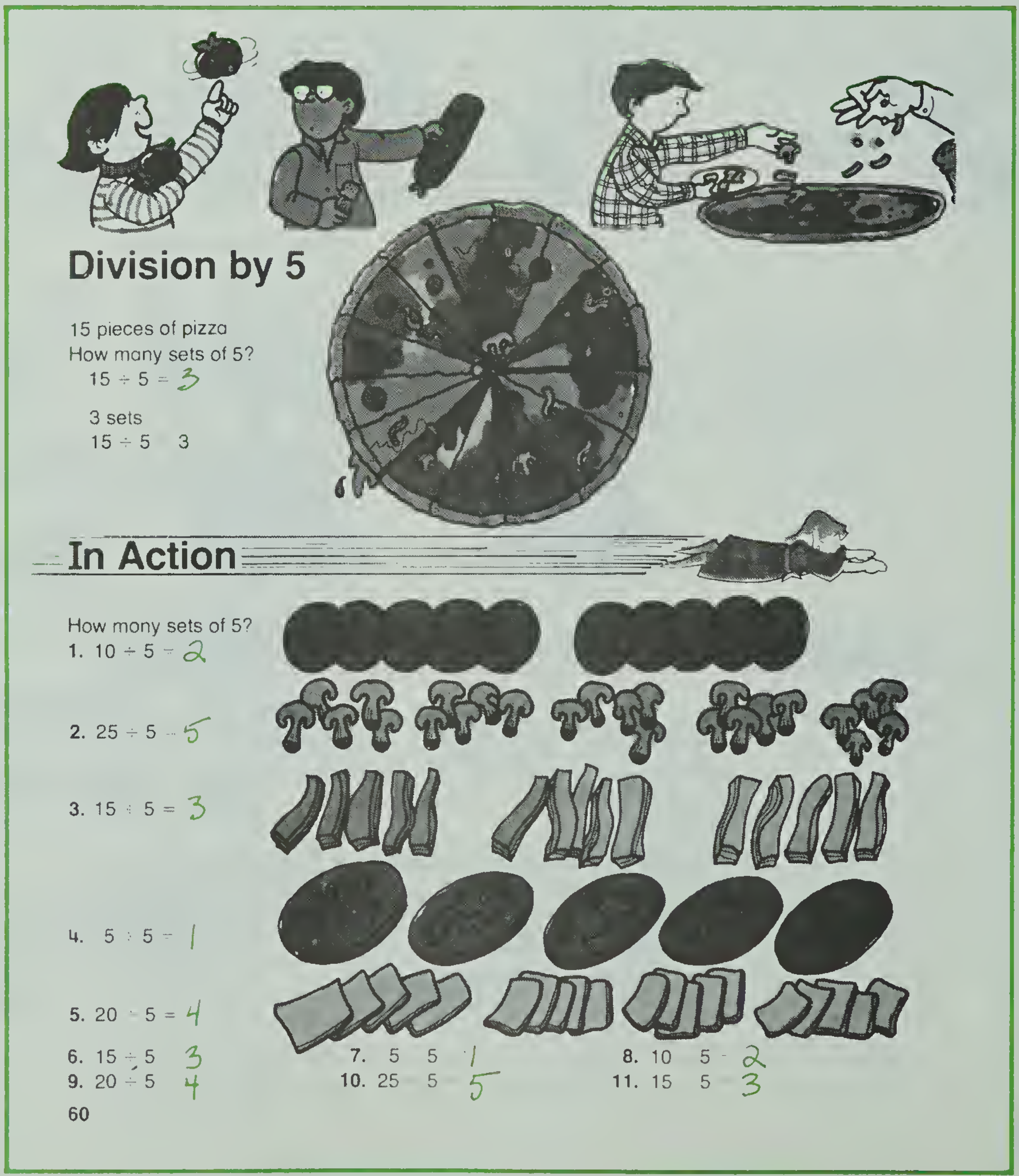
Draw 10 objects.
Loop sets of 2.

Have the children select two or three situations and illustrate each.



For an additional challenge the children could be asked to record the appropriate division sentence with the illustration.

12 ÷ 4 = 3



Division by 5

15 pieces of pizza
How many sets of 5?
15 ÷ 5 = 3

3 sets
15 ÷ 5 = 3

In Action

How many sets of 5?
1. 10 ÷ 5 = 2
2. 25 ÷ 5 = 5
3. 15 ÷ 5 = 3
4. 5 ÷ 5 = 1
5. 20 ÷ 5 = 4
6. 15 ÷ 5 = 3
7. 5 ÷ 5 = 1
8. 10 ÷ 5 = 2
9. 20 ÷ 5 = 4
10. 25 ÷ 5 = 5
11. 15 ÷ 5 = 3

60

Unit 1 Section 7 Lesson 6

Dividing Groups of Objects into Sets of One, from 1 ÷ 1 to 5 ÷ 1

Materials

- for each child
  - counters
  - blank cards for making a personal set of flash cards

Rationale

Dividing by one requires special attention in order to teach the concept of dividing several objects into sets of one object each.

Lesson

1

Gather the children around the easel and distribute counters. Write a division fact.

12 ÷ 4 = 3

Have each child in the group use counters to illustrate the meaning of the sentence. Have one child interpret the illustrations. Repeat for these division facts: 10 ÷ 2 = 5, 15 ÷ 5 = 3, 15 ÷ 3 = 5 and 8 ÷ 2 = 4.

2

Show four counters. Have a child divide the counters into sets of one and ask for the number of sets. Write *4 ÷ 1 = 4* on the easel and point out that the number of sets is the same as the number of counters. Repeat this for 5 ÷ 1, 3 ÷ 1, 1 ÷ 1 and 2 ÷ 1.

3

Use repeated subtraction and number lines for illustrating sets of one. These activities will reinforce the concept of sets of one.

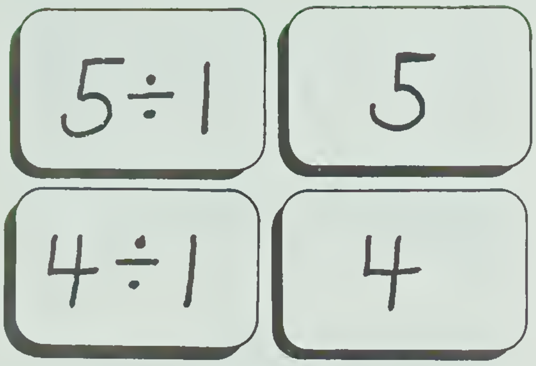
Written and Other Activities

☐

mathways 3, page 61

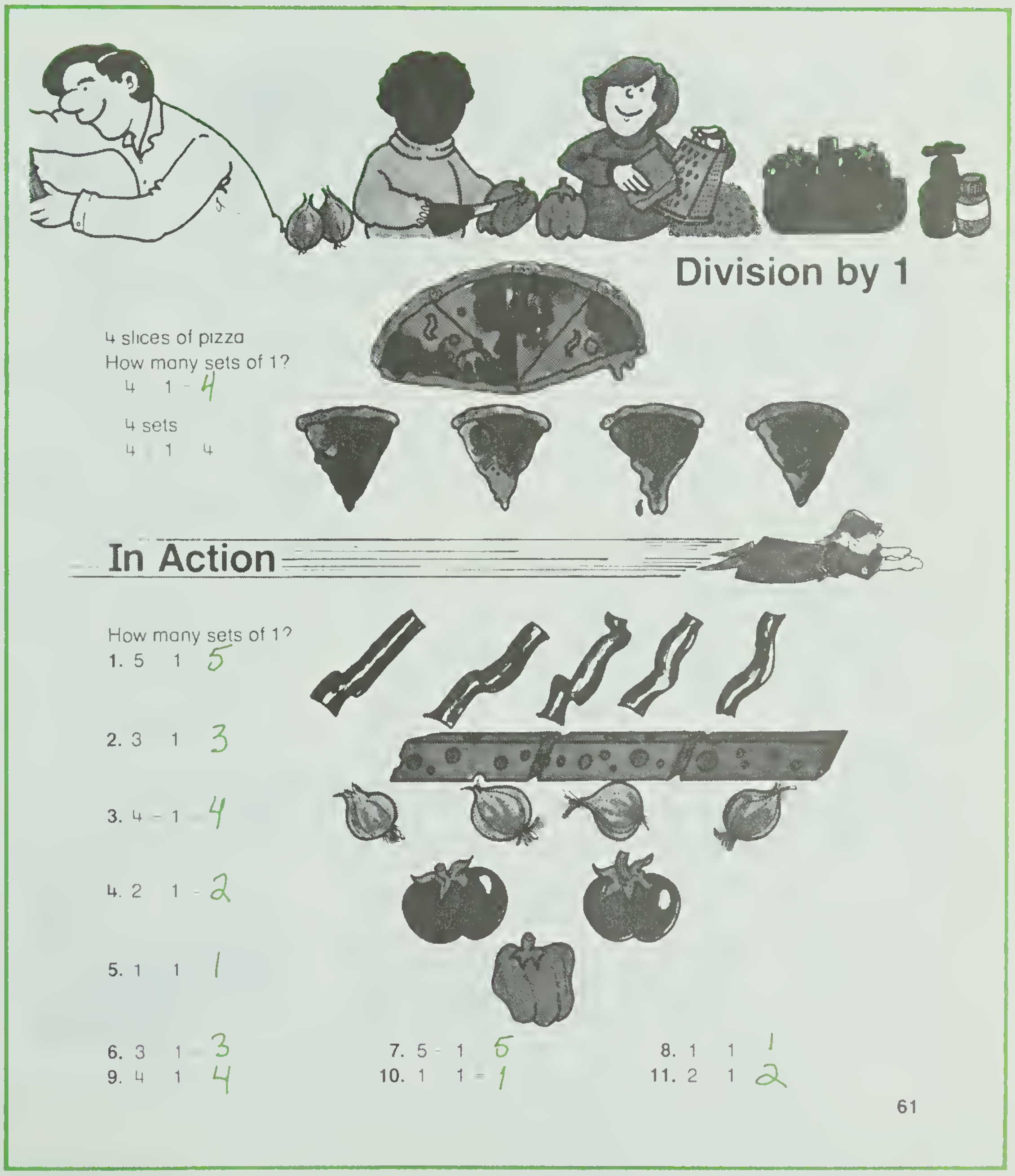
☐ ☐

Have each child prepare a personal set of division flash cards. On one side of a card is written a division expression. On the reverse side is recorded the quotient.



These can serve several purposes: they can be taken home and used by the child and an interested adult; they can be used with a partner in spare time; or they can be used by children working alone to improve recall of division facts.

For Your Notes



Division by 1

4 slices of pizza
How many sets of 1?
4 ÷ 1 = 4

4 sets
4 ÷ 1 = 4

In Action

How many sets of 1?
1. 5 ÷ 1 = 5
2. 3 ÷ 1 = 3
3. 4 ÷ 1 = 4
4. 2 ÷ 1 = 2
5. 1 ÷ 1 = 1

6. 3 ÷ 1 = 3
7. 5 ÷ 1 = 5
8. 1 ÷ 1 = 1
9. 4 ÷ 1 = 4
10. 1 ÷ 1 = 1
11. 2 ÷ 1 = 2

61

Unit 1 Section 7 Lesson 7

Dividing a Group of Objects into Sets of Two, Three, Four and Five

Materials

- counters

Rationale

This page provides practice for the skills presented in Section 7 thus far. The amount of time required for the lesson depends on the skill demonstrated by the children during the previous lessons. This page can be used as a check to determine if review is necessary and what skills need to be strengthened.

Lesson

1

Gather the children around the easel. Write *12 ÷ 3* on the easel and ask for the answer. Have the children select 12 counters and divide them into sets of three to illustrate the division. Repeat this activity for questions that involve dividing by two, three, four and five.

Written and Other Activities

☐

mathways 3, page 62

Encourage the children to do the questions without counters when possible, but have them use counters to complete or check questions whenever necessary.

☐ ☐

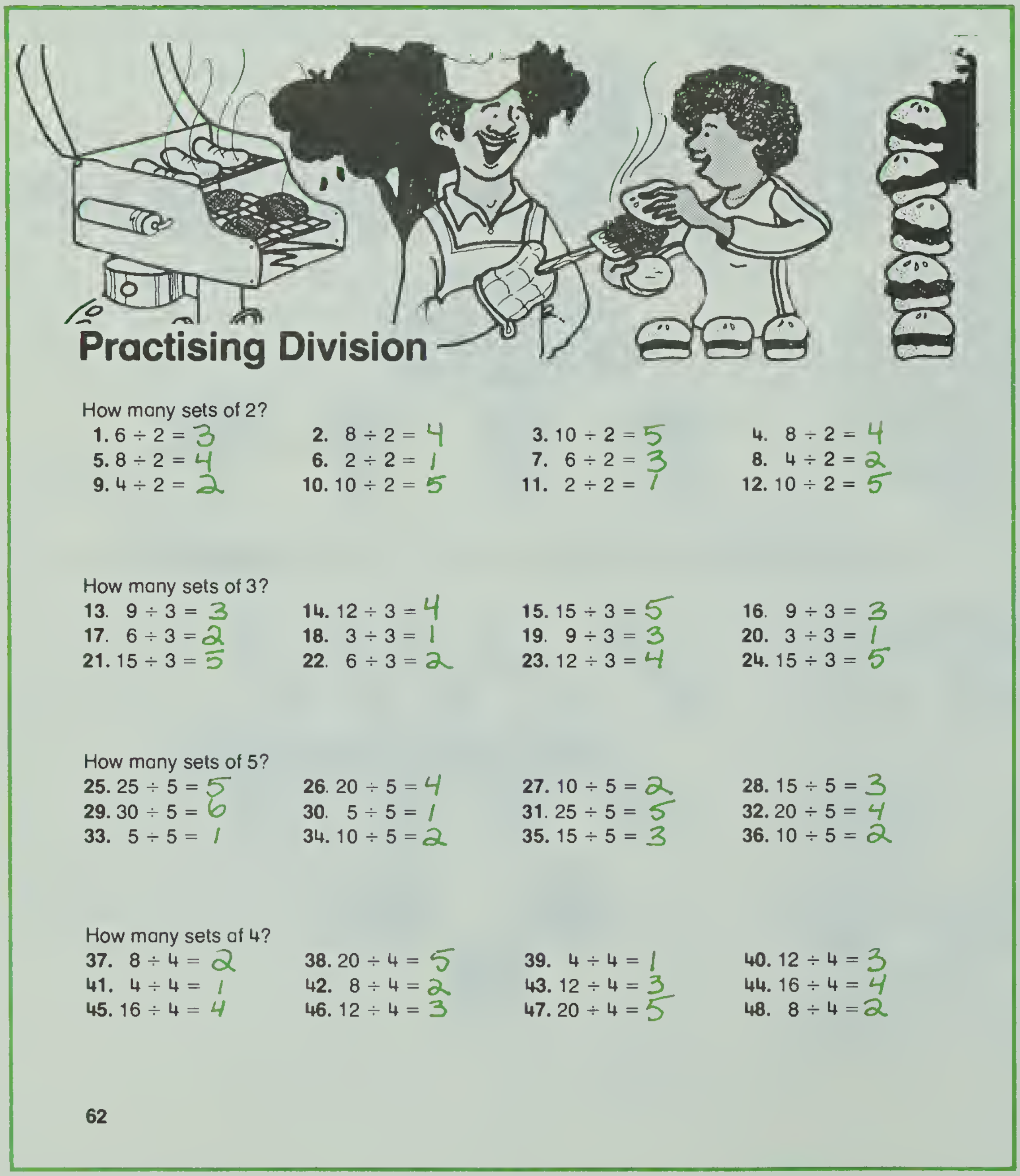
Have the children draw pictures for several of the exercises on page 62.

☐ ☐ ☐

Two children can play a game of Xs and Os with the usual rules except for the following: before a player has a turn, the other player reads a question on page 62 and the player taking a turn gives the answer. If the answer is correct, the player draws an X or an O. If the answer is not correct, the player misses a turn.

☐ ☐ ☐ ☐

If the children seem to have difficulty dividing by a particular number, use activities suggested on the appropriate page for review.



Practising Division

How many sets of 2?

1. 6 ÷ 2 = 3
2. 8 ÷ 2 = 4
3. 10 ÷ 2 = 5
4. 8 ÷ 2 = 4
5. 8 ÷ 2 = 4
6. 2 ÷ 2 = 1
7. 6 ÷ 2 = 3
8. 4 ÷ 2 = 2
9. 4 ÷ 2 = 2
10. 10 ÷ 2 = 5
11. 2 ÷ 2 = 1
12. 10 ÷ 2 = 5

How many sets of 3?

13. 9 ÷ 3 = 3
14. 12 ÷ 3 = 4
15. 15 ÷ 3 = 5
16. 9 ÷ 3 = 3
17. 6 ÷ 3 = 2
18. 3 ÷ 3 = 1
19. 9 ÷ 3 = 3
20. 3 ÷ 3 = 1
21. 15 ÷ 3 = 5
22. 6 ÷ 3 = 2
23. 12 ÷ 3 = 4
24. 15 ÷ 3 = 5

How many sets of 5?

25. 25 ÷ 5 = 5
26. 20 ÷ 5 = 4
27. 10 ÷ 5 = 2
28. 15 ÷ 5 = 3
29. 30 ÷ 5 = 6
30. 5 ÷ 5 = 1
31. 25 ÷ 5 = 5
32. 20 ÷ 5 = 4
33. 5 ÷ 5 = 1
34. 10 ÷ 5 = 2
35. 15 ÷ 5 = 3
36. 10 ÷ 5 = 2

How many sets of 4?

37. 8 ÷ 4 = 2
38. 20 ÷ 4 = 5
39. 4 ÷ 4 = 1
40. 12 ÷ 4 = 3
41. 4 ÷ 4 = 1
42. 8 ÷ 4 = 2
43. 12 ÷ 4 = 3
44. 16 ÷ 4 = 4
45. 16 ÷ 4 = 4
46. 12 ÷ 4 = 3
47. 20 ÷ 4 = 5
48. 8 ÷ 4 = 2

62

Unit 1 Section 7 Lesson 8

Using Division to Solve Word Problems

Materials

- counters

Rationale

These word problems show applications of division and also present an opportunity to practise division skills. For each problem, the number of objects altogether and the number of objects in each set are given, and the children are asked to find the number of equal sets.

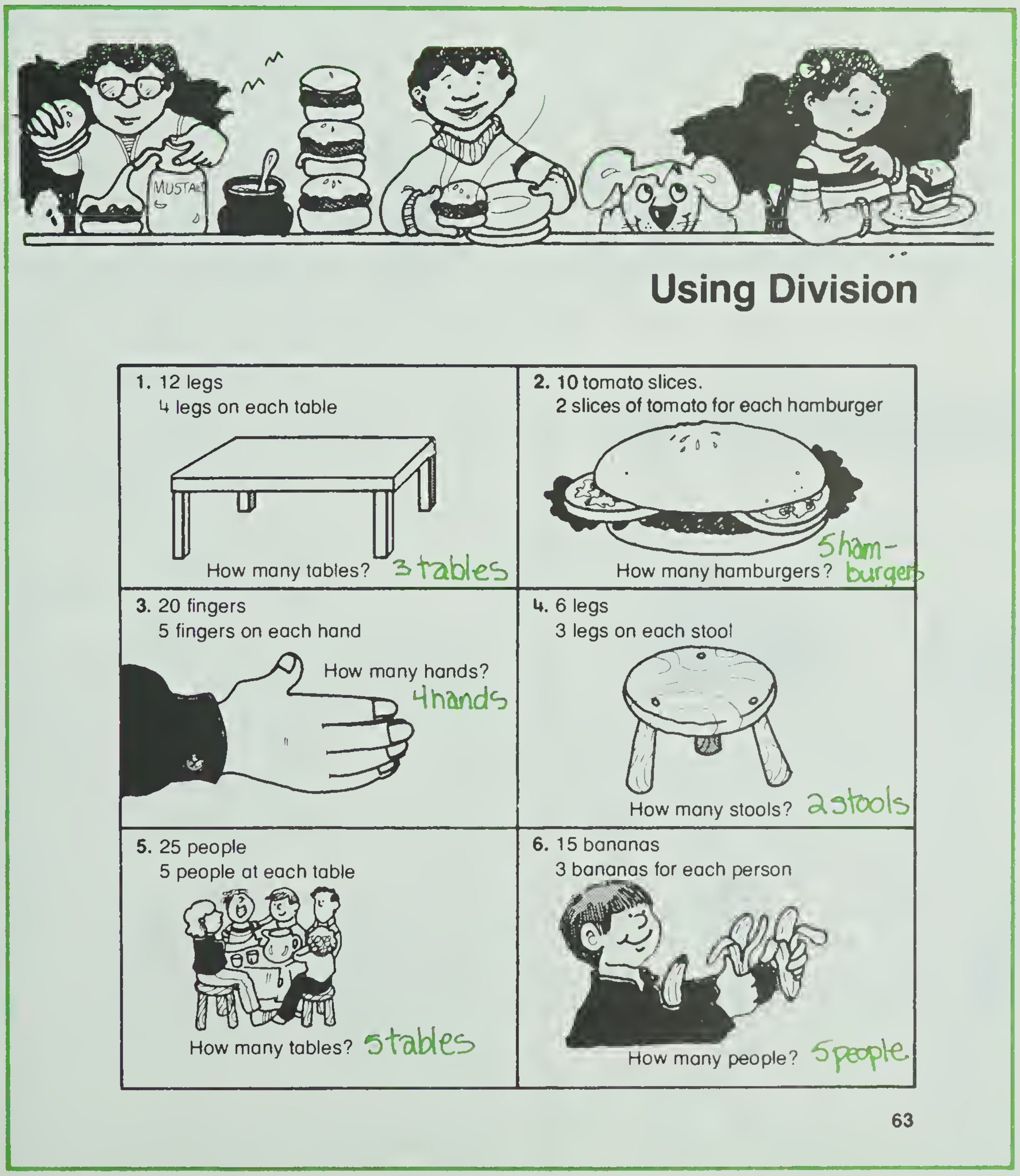
Lesson

1

Gather the children into the working area. Write the following word problem on the easel.

8 books
2 books for each child
How many children?

Ask
How many counters are needed to show this division?
Have a child select eight counters.
How many counters will be in each set?
Have a child divide the eight counters into sets of two.
How many sets are there?
Write the division sentence on the easel.
8 ÷ 2 = 4
Have a child answer the problem in a sentence. Repeat the procedure for a few other problems.



Using Division

1. 12 legs
4 legs on each table
How many tables? 3 tables

2. 10 tomato slices.
2 slices of tomato for each hamburger
How many hamburgers? 5 ham-burgers

3. 20 fingers
5 fingers on each hand
How many hands? 4 hands

4. 6 legs
3 legs on each stool
How many stools? 2 stools

5. 25 people
5 people at each table
How many tables? 5 tables

6. 15 bananas
3 bananas for each person
How many people? 5 people.

63

Written and Other Activities

☐

mathways 3, page 63
Using counters or drawing illustrations may help children answer the problems.

☐ ☐

Children can make up, illustrate and answer word problems similar to those on page 63. Some children may have difficulty finding numbers that divide evenly to use in their problems. They could use counters to find the numbers for their problems by trial and error.

☐ ☐ ☐

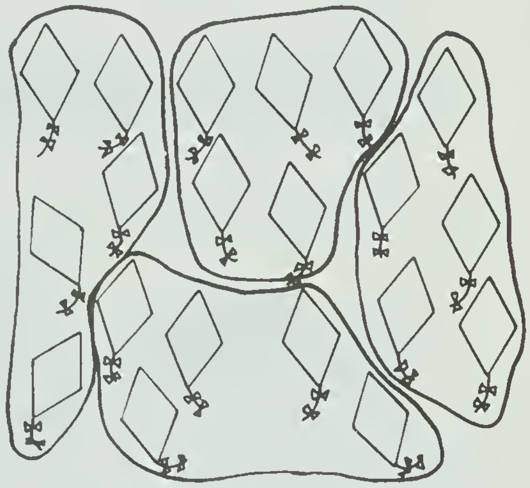
Write a series of directions such as the following on the easel.

Draw 20 objects.
Loop sets of 5.

Draw 12 objects.
Loop sets of 4.

Draw 10 objects.
Loop sets of 2.

Have the children select two or three situations and illustrate each.



For an additional challenge the children could be asked to record the appropriate division sentence with the illustration.
12 ÷ 4 = 3

☐ ☐ ☐ ☐
mathways 3 Practice Masters page 12

☐ ☐ ☐ ☐ ☐
mathways 3 Tests 3A, 3B

☐ ☐ ☐ ☐ ☐ ☐
mathways 3 Plus Workbook page 17

Unit 1 Section 7 Lesson 9

Multiplying and Dividing by One, Two, Three, Four and Five

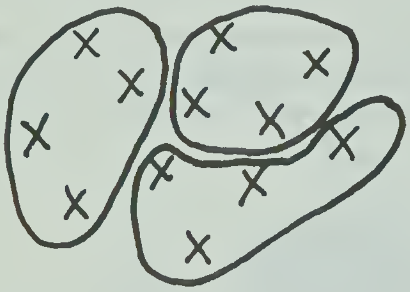
Materials

- multiplication-fact cards
- division-fact cards
- for each child
  - blank cards, or personal sets of multiplication and division flash cards prepared in earlier lessons

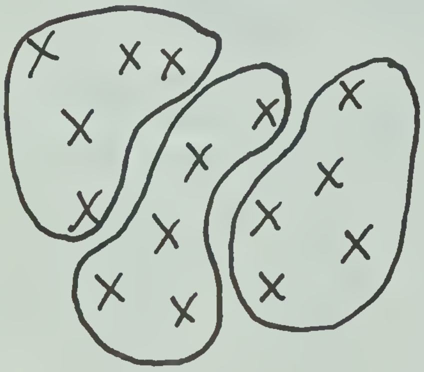
Lesson

1

Have children answer orally multiplication questions such as 3 × 4 and division questions such as 15 ÷ 5. When necessary, draw a picture on the easel to help find or check an answer.



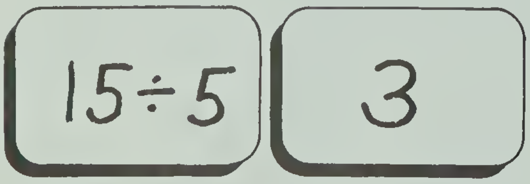
3 × 4

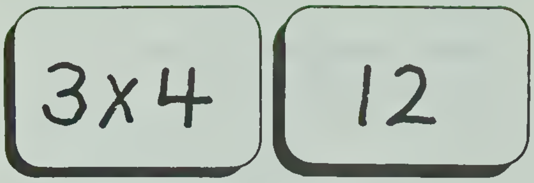


15 ÷ 5.

2

If the children have not already done so, have each child prepare a personal set of flash cards for multiplication and division facts. The multiplication and division expressions can be written on one side of the cards, and the products and quotients on the reverse side.





Written and Other Activities

☐

mathways 3, page 64

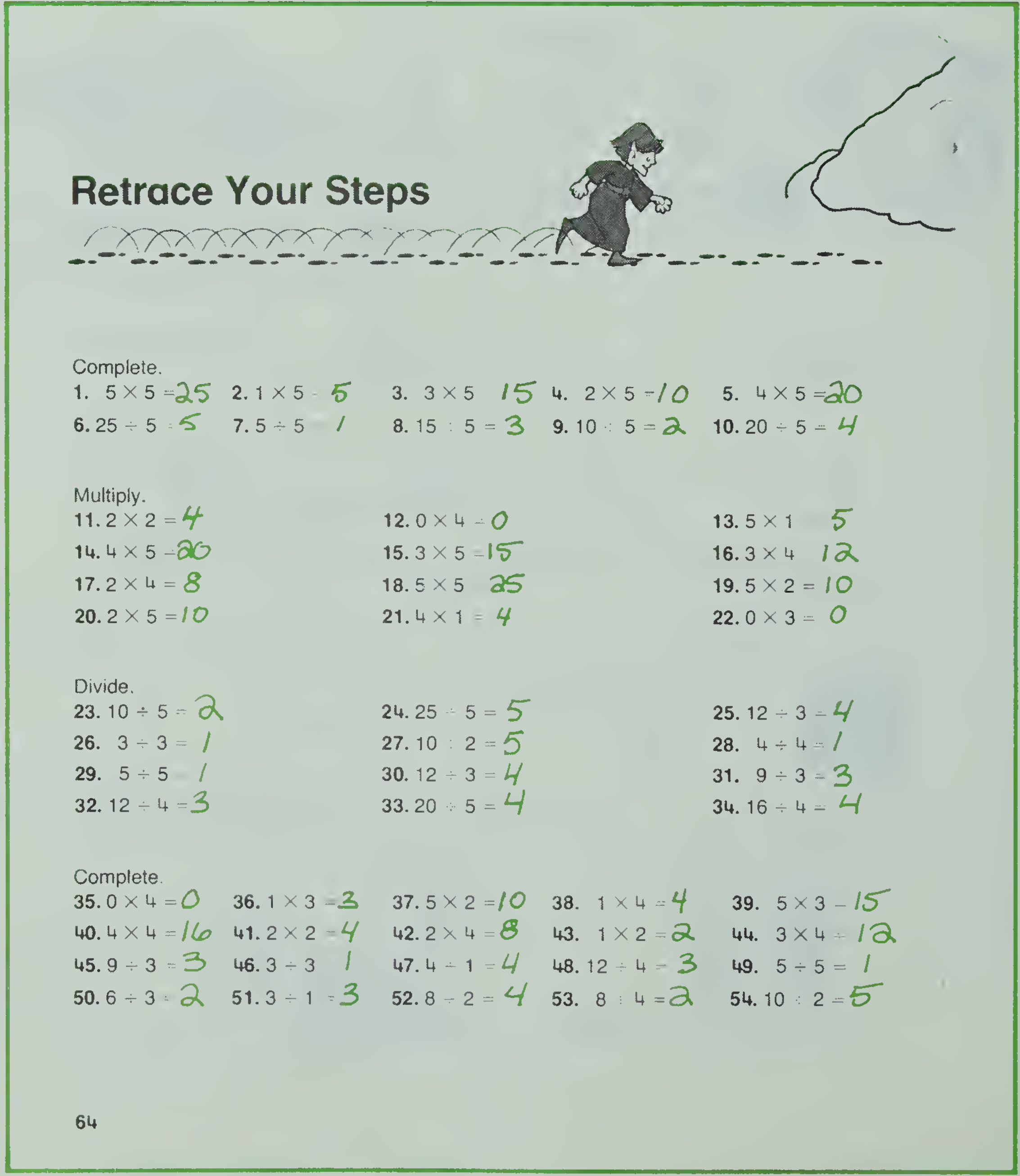
If children have difficulty with multiplication, use the teaching notes provided for *mathways 3* pages 43 to 55 for review.

☐ ☐

Have the children illustrate some of the exercises on page 64 as shown for the lesson.

☐ ☐ ☐

Children can work in pairs and ask each other multiplication and division questions. Limit the range of division so that no remainders result. To quiz each other, children could use completed, corrected copies of their work from page 64; or they could use the flash cards prepared in Activity 2.



Retrace Your Steps

Complete.

1. 5 × 5 = 25 2. 1 × 5 = 5 3. 3 × 5 15 4. 2 × 5 = 10 5. 4 × 5 = 20
6. 25 ÷ 5 = 5 7. 5 ÷ 5 1 8. 15 ÷ 5 = 3 9. 10 ÷ 5 = 2 10. 20 ÷ 5 = 4

Multiply.

11. 2 × 2 = 4 12. 0 × 4 = 0 13. 5 × 1 5
14. 4 × 5 = 20 15. 3 × 5 = 15 16. 3 × 4 12
17. 2 × 4 = 8 18. 5 × 5 25 19. 5 × 2 = 10
20. 2 × 5 = 10 21. 4 × 1 = 4 22. 0 × 3 = 0

Divide.

23. 10 ÷ 5 = 2 24. 25 ÷ 5 = 5 25. 12 ÷ 3 = 4
26. 3 ÷ 3 = 1 27. 10 ÷ 2 = 5 28. 4 ÷ 4 = 1
29. 5 ÷ 5 1 30. 12 ÷ 3 = 4 31. 9 ÷ 3 = 3
32. 12 ÷ 4 = 3 33. 20 ÷ 5 = 4 34. 16 ÷ 4 = 4

Complete.

35. 0 × 4 = 0 36. 1 × 3 = 3 37. 5 × 2 = 10 38. 1 × 4 = 4 39. 5 × 3 = 15
40. 4 × 4 = 16 41. 2 × 2 = 4 42. 2 × 4 = 8 43. 1 × 2 = 2 44. 3 × 4 = 12
45. 9 ÷ 3 = 3 46. 3 ÷ 3 1 47. 4 ÷ 1 = 4 48. 12 ÷ 4 = 3 49. 5 ÷ 5 = 1
50. 6 ÷ 3 = 2 51. 3 ÷ 1 = 3 52. 8 ÷ 2 = 4 53. 8 ÷ 4 = 2 54. 10 ÷ 2 = 5

64

Unit 1 Section 8 Lesson 1

Estimating Lengths: Greater Than or Less Than One Metre

Materials

- metre stick
- for each child
  - string
  - chalk

Rationale

Using non-standard units of length when beginning to estimate and measure helps the children to understand the concept of length, and learn how to measure. Most children will have had many experiences estimating and measuring with non-standard units in previous grades. If they have not or if they seem to be unsure about measuring, have them estimate and measure with non-standard units before starting the work with standard units; some suggestions for activities are given under Written and Other Activities.

It is important for the children to always estimate before measuring. This helps them understand a given unit of length and teaches them to apply estimation skills in common situations where measuring equipment is not available.

Experience in measuring is a necessary part of learning to use units of measurement. Provide many opportunities for the children to practise measuring.

Lesson

1

Seat the children around the working area. Show a metre stick and tell the children that it is one metre long. Write

one metre *1* m

on the easel.

Explain that the symbol m stands for metre.

2

Have the children estimate where a metre stick held beside them would come. Check this by having each of the children stand beside a metre stick.

3

Tell each child to use two hands spread apart to show an estimate for the length of 1 m. Check each estimate with a metre stick.

4

Have each child cut a string 1 m long. The actual measuring and cutting seems to help establish the concept of the length of 1 m. The strings can be used in the next two activities.

5

Ask children to name objects in the classroom they think have a length greater than 1 m. After each object is named, have a child place a metre string beside it.

6

Ask children to name objects in the classroom that have a length less than 1 m. After each object is named, have a child place a metre string beside it.

Written and Other Activities

☐

mathways 3, page 65

☐ ☐

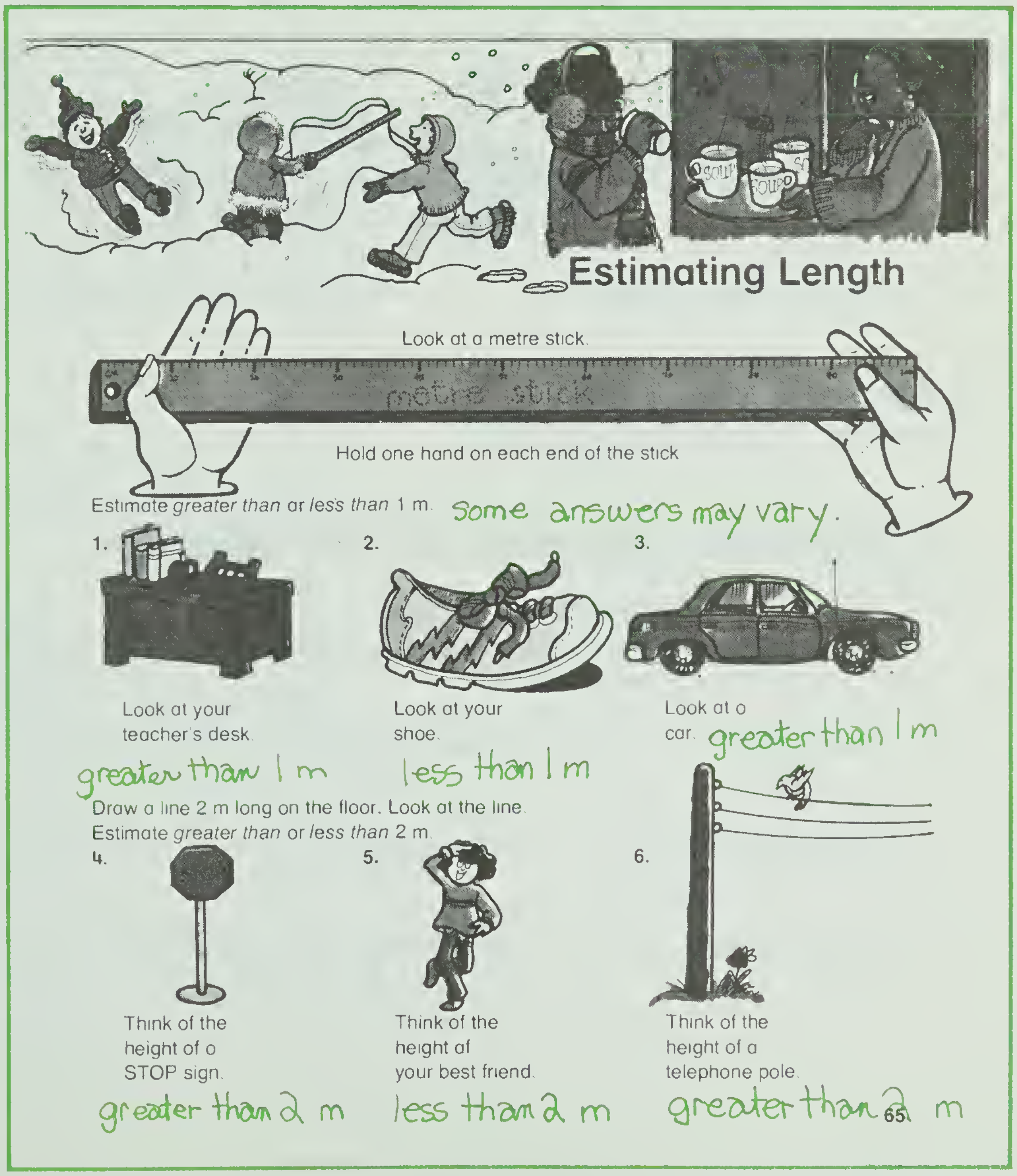
For practise measuring with non-standard units, have the children measure a variety of objects using units such as a pencil, an eraser or a finger. Record the results in a chart.

☐ ☐ ☐

Select several non-standard units and use steps 2 through 5 of the lesson with each.

☐ ☐ ☐ ☐

Have the children list five objects whose length is greater than 1 m and five whose length is less than 1 m and then use their metre string to check.



Estimating Length

Look at a metre stick.

Hold one hand on each end of the stick

Estimate *greater than* or *less than* 1 m. Some answers may vary.

1. Look at your teacher's desk. greater than 1 m

2. Look at your shoe. less than 1 m

3. Look at a car. greater than 1 m

Draw a line 2 m long on the floor. Look at the line.
Estimate *greater than* or *less than* 2 m.

4. Think of the height of a STOP sign. greater than 2 m

5. Think of the height of your best friend. less than 2 m

6. Think of the height of a telephone pole. greater than 2 m

65

Unit 1 Section 8 Lesson 2
Estimating, Measuring and Recording Lengths to the Nearest Metre

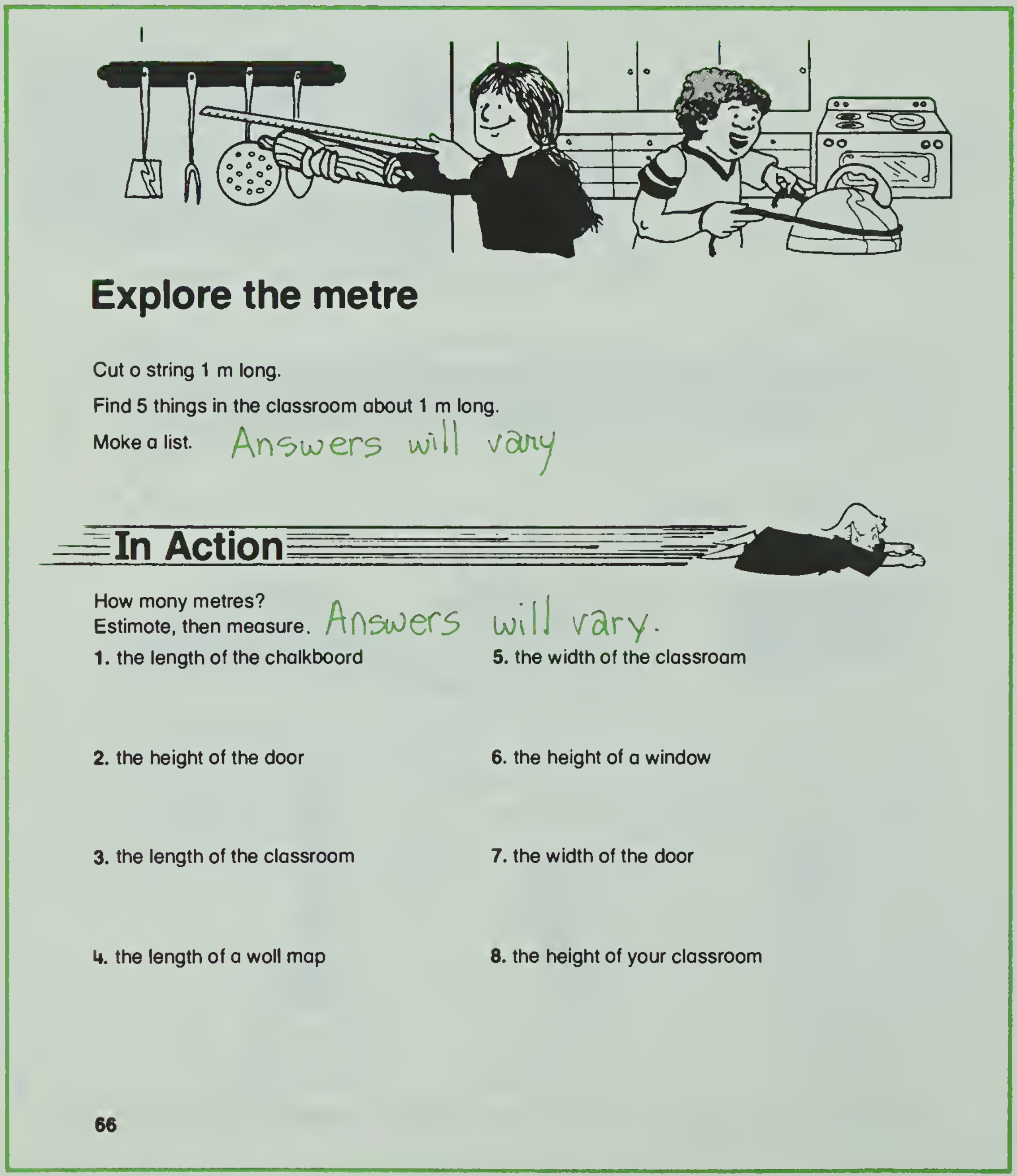
Materials
- metre sticks
- string
- pair of scissors
- tape measure
- ruler marked in centimetres
- activity cards

Rationale
During lessons on measurement it is important that the children check each estimate by measuring immediately, while they are still thinking about the estimate. The resulting comparison helps them to make the next estimate more successfully.

Set up a measuring centre to be used while the children work on pages 65 through 69. Put metre sticks, tape measures and rulers marked in centimetres in the centre. Activity cards can also be placed at the centre or each child can write an activity card and follow the instructions. These child-created activity cards can be left at the centre for others to use. As an example, a child might write an instruction to estimate and then measure the length of a table to the nearest metre.

Lesson
1

Provide metre sticks, string and scissors a day or a few hours before the lesson so that a few children at a time can each cut a string 1 m long while others are involved in another activity.



Explore the metre

Cut a string 1 m long.

Find 5 things in the classroom about 1 m long.

Make a list. Answers will vary

In Action

How many metres?

Estimate, then measure. Answers will vary.

1. the length of the chalkboard
2. the height of the door
3. the length of the classroom
4. the length of a wall map
5. the width of the classroom
6. the height of a window
7. the width of the door
8. the height of your classroom

66

2

Compare a string that is 1 m long and a metre stick. Ask a child to name an object in the classroom that is about 1 m long. Have a child compare a 1 m length of string with the object. Repeat this several times.

3

Have two children put their 1 m strings end-to-end. Have the children become familiar with this 2 m length. Repeat the activity for 3 m, 4 m and 5 m.

4

Name a length, such as the distance between two chairs.

Ask a child

About how many metres do you think the distance is?

Have the children use 1 m string lengths placed end-to-end to measure the distance to the nearest metre. Have them compare their estimates with the measurement. Emphasize that a measurement must include a unit such as metres. Repeat this several times for different distances.

Written and Other Activities
☐

mathways 3, page 66

Have the children use their strings to compare with the objects that they list as about 1 m long for page 66. For 1 through 8, remind the children to record an estimate and then measure the length before starting the next question. Emphasize that an estimate is not intended to be the same as the exact measurement. Remind the children to print the symbol m with each estimate and measurement.

☐ ☐

Children may want to take their strings home and make a chart giving the lengths of various household objects.

Object	Estimate	Measurement
	m	m

Unit 1 Section 8 Lesson 3

Estimating Lengths Greater Than or Less Than 5 cm, 10 cm, 15 cm

Materials

- for each child
  - – centimetre ruler
  - – cardboard strip 1 cm by 21 cm

Rationale

In our measurement system, all units for measuring length, or distance, are based on the metre: 1 m is the same distance as 100 cm; 1 cm is the same as 0.01 m. Calibrating a cardboard strip in centimetres seems to increase the children's awareness of the centimetre.

Lesson

1

Gather the children around the working area. Give each child a centimetre ruler. Point out and name a 1 cm unit, and write on the easel

centimetre

Have each child in the group show a 1 cm unit on a ruler. Compare the centimetre and metre lengths by showing 1 cm on a metre stick.

Draw a line 1 cm long on the easel. Have each child draw a 1 cm line on paper.

2

Tell the children to show the distance of 1 cm by holding their fingers apart. Have them check their estimates on their centimetre rulers. Repeat the procedure for distances of 5 cm, 10 cm and 15 cm.

Write on the easel

5 cm 10 cm 15 cm

Have the children read the expressions.

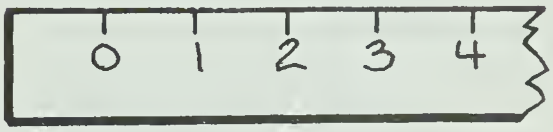
3

Without using a ruler, have the children each draw a line segment which they estimate to be 5 cm long. Then have each of them check with a ruler. Repeat the procedure for 10 cm, 15 cm and 1 cm.

4

Have each child make a centimetre ruler. Distribute cardboard strips 1 cm by 21 cm and have the children calibrate a 20 cm rule, using their centimetre rulers as a guide.

The extra centimetre length is to allow space to show the 0 marking.



List five classroom objects on the easel and have the children estimate then use their new rulers to measure the length of each object.

Written and Other Activities

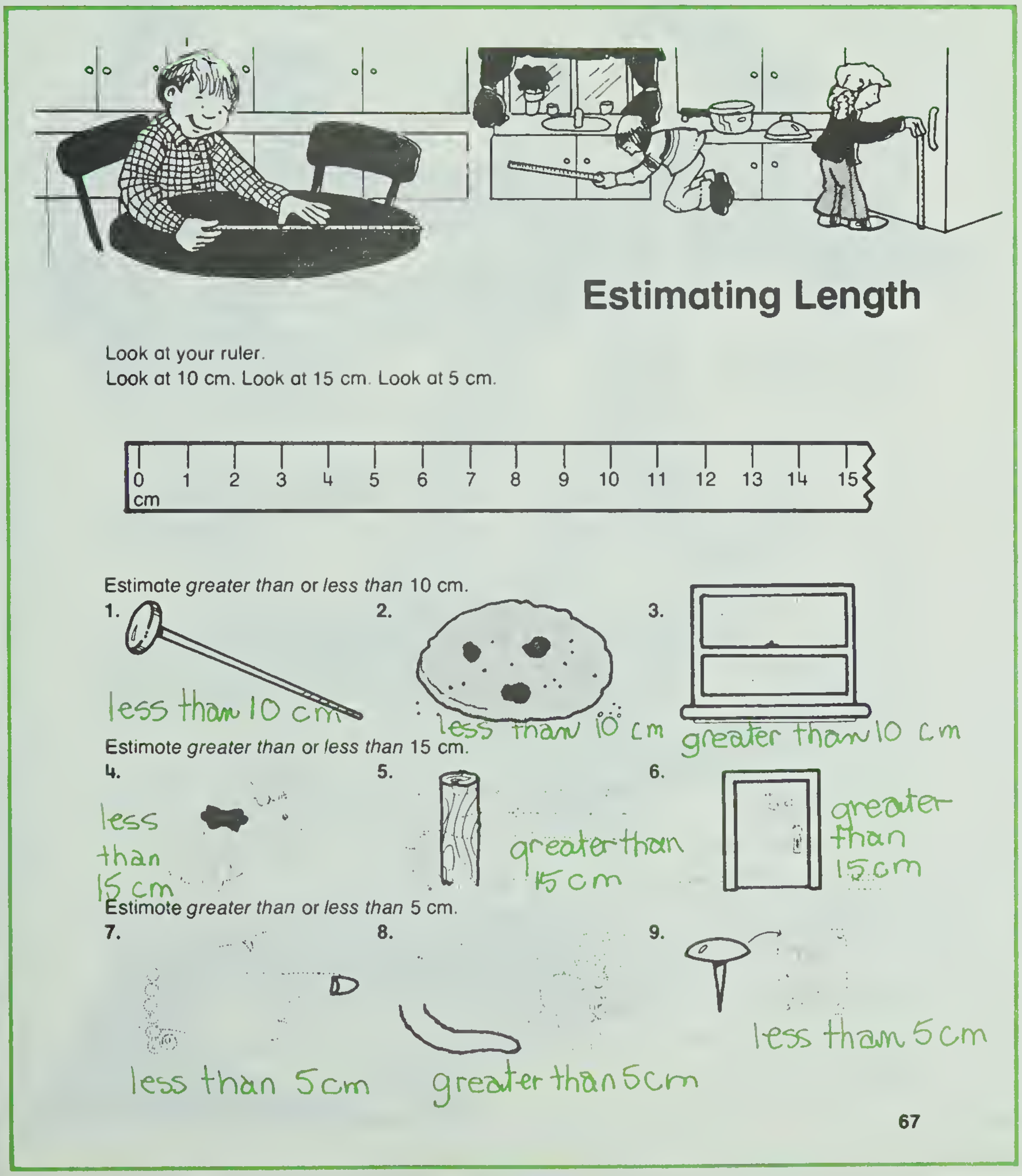
☐

mathways 3, page 67

Discuss the illustration at the top of the page before assigning the estimation activities.

☐ ☐

Have the children list three objects with lengths greater than 10 cm and three with lengths less than 10 cm. Have them check their estimates by measuring the objects with their rulers.



Estimating Length

Look at your ruler.
Look at 10 cm. Look at 15 cm. Look at 5 cm.

0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
cm

Estimate *greater than* or *less than* 10 cm.

1. less than 10 cm
2. less than 10 cm
3. greater than 10 cm

Estimate *greater than* or *less than* 15 cm.

4. less than 15 cm
5. greater than 15 cm
6. greater than 15 cm

Estimate *greater than* or *less than* 5 cm.

7. less than 5 cm
8. greater than 5cm
9. less than 5 cm

67

Unit 1 Section 8 Lesson 4

Estimating and Measuring Lengths to the Nearest Centimetre; Using the Symbol cm

Materials

- activity cards
- lengths of string: 2 cm, 5 cm, 10 cm, 20 cm, 15 cm, 25 cm, 50 cm, 75 cm
- for each child
  - – centimetre rulers
  - – copy of stencil, *see* ☐ ☐ ☐ ☐ ☐

Lesson

1

Gather the children around the working area. Distribute the 20 cm rulers made during the previous lesson. Then, naming a classroom object, ask the children

About how many centimetres long do you think the object is?

Record the estimates on the easel beside each child's name, emphasizing the necessity to use the symbol cm. Have a child measure the length of the object named to the nearest centimetre. Discuss which estimate was closest to the measurement. On most rulers there is a space between the end of the ruler and the zero mark. Explain that the zero mark, not the end of the ruler, must be aligned with the end of the object being measured.

Repeat the activity several times, naming other classroom objects and involving each child in measuring.

2

Attach 2 cm, 10 cm and 20 cm lengths of string to the easel. Have children estimate which length is 10 cm and then check by measuring. Reorder and add to the lengths of string attached to the easel and repeat, having children pick out lengths likely to be 5 cm, 10 cm and 15 cm.

Vary the activity by using lengths of 25 cm, 50 cm and 75 cm and having the children select the one most likely to be 50 cm, 25 cm and so forth. Have them record each estimate on the easel, measure and record the length of each.

Written and Other Activities

☐

mathways 3, pages 68, 69

Discuss the illustration, emphasizing that measuring ingredients for a recipe would require the use of different units than measuring lengths, but that the goal is the same. Ask children what might happen if people didn't measure the materials for a cake or for a desk or table. Would the cake taste the same, no matter what amounts were used? Would the desk tops and table tops all be equal in size if any lengths of wood were used?

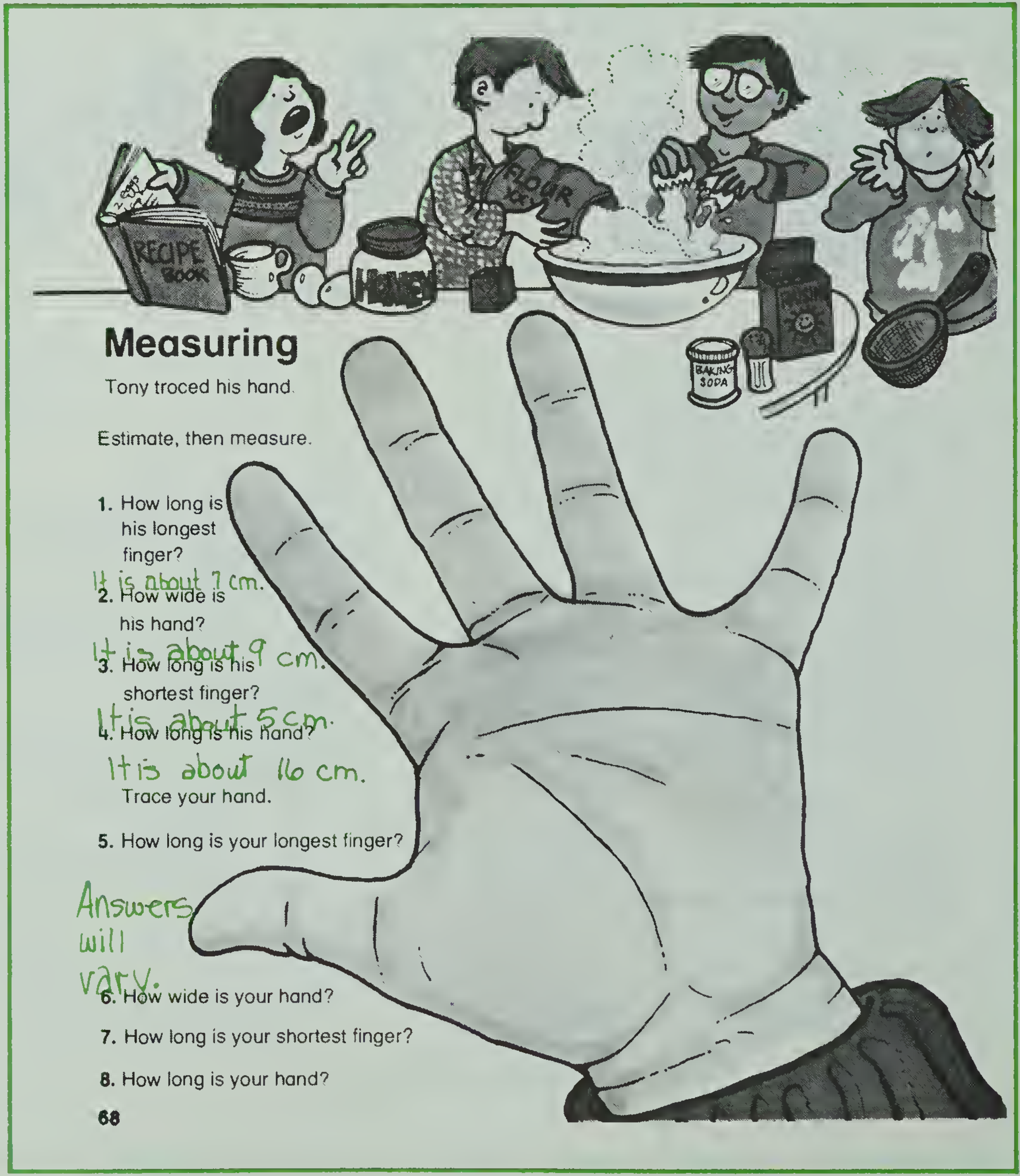
Discuss the measuring activity on page 68, asking children to think of practical applications for knowing the measurements of a hand.

☐ ☐

Place activity cards in the measuring centre and have children complete them.

☐ ☐ ☐

Have the children draw bar graphs to compare the objects measured for page 69.



Measuring

Tony traced his hand.

Estimate, then measure.

1. How long is his longest finger?
It is about 7 cm.
2. How wide is his hand?
It is about 9 cm.
3. How long is his shortest finger?
It is about 5 cm.
4. How long is his hand?
It is about 16 cm.

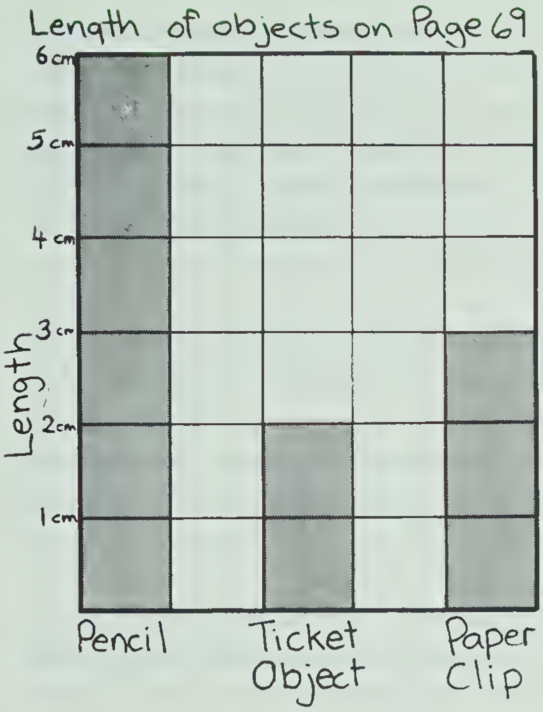
Trace your hand.

5. How long is your longest finger?

Answers will vary.

6. How wide is your hand?
7. How long is your shortest finger?
8. How long is your hand?

68



☐ ☐ ☐ ☐

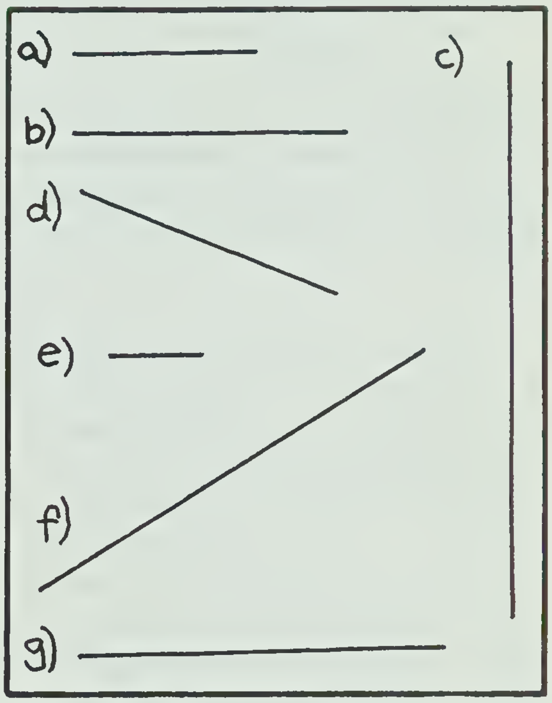
Have the children make charts for the objects they choose to measure, reminding them that the steps are:

- select an object and write its name
- record an estimate in the unit used
- measure and record the length in the unit
- compare the estimate and the measurement

Object	Estimate	Measurement
	cm	cm

☐ ☐ ☐ ☐ ☐

Distribute copies of a stencil such as the one in the right column for the children to complete:



☐ ☐ ☐ ☐ ☐ ☐
mathways 3 Practice Masters page 13
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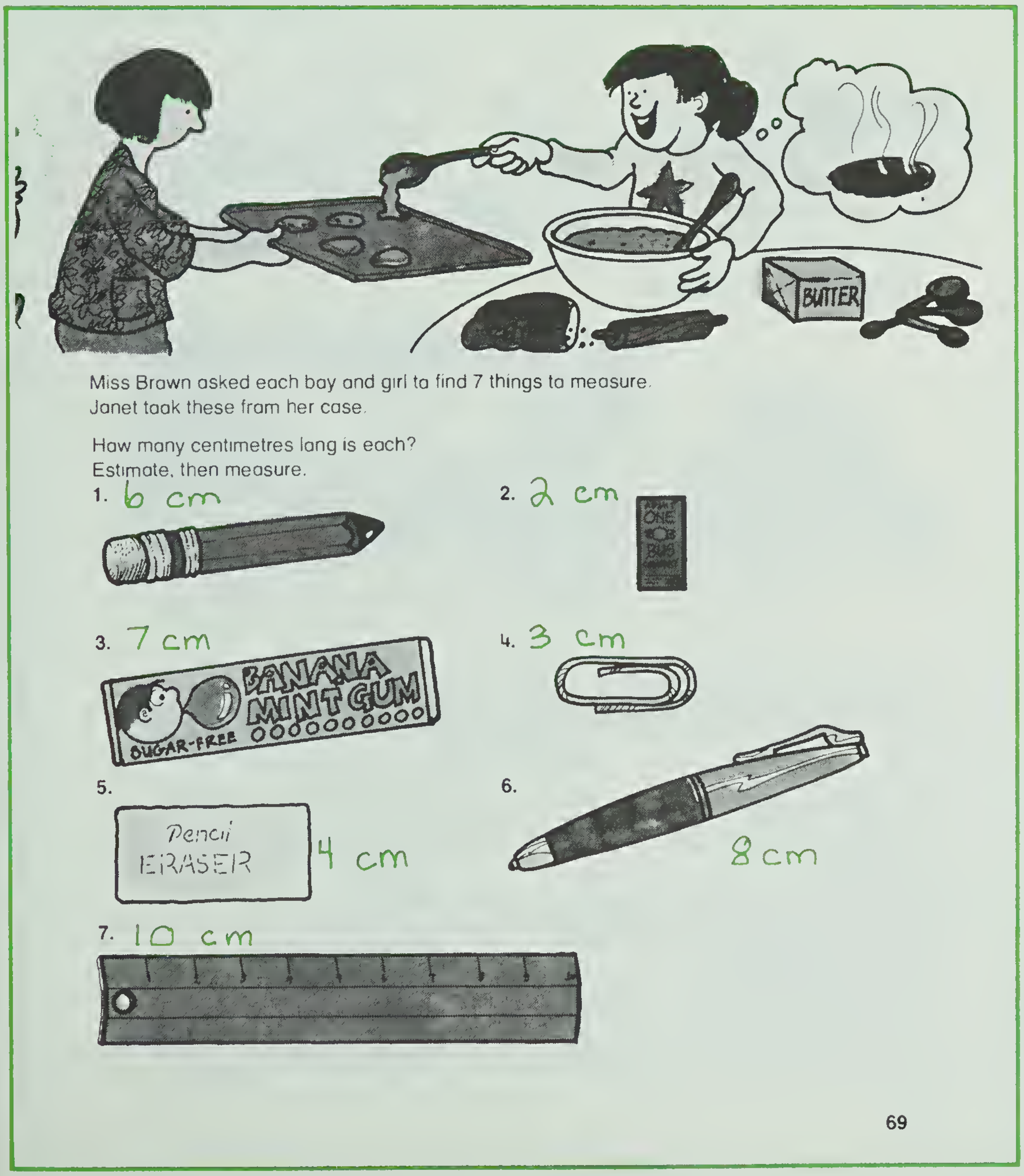
mathways 3 Plus Workbook page 18



Miss Brown asked each boy and girl to find 7 things to measure.
Janet took these from her case.

How many centimetres long is each?
Estimate, then measure.

1. 6 cm
2. 2 cm
3. 7 cm
4. 3 cm
5. 4 cm
6. 8 cm
7. 10 cm

69

Unit 1 Section 8 Lesson 5

Exploring Money: Coins and Bills to the Value of $1.00

Materials

- 100 pennies, 20 nickels, 10 dimes, 4 quarters, 2 half-dollars and 1 dollar bill
- play money, reproduced from Program Masters 8 to 14

Rationale

Activities that involve using coins are an important part of learning about money. They also add interest to the lessons.

The children should have experiences with real money, especially in the group instructional period. Perhaps it could be arranged to have change available for such instruction. A container of change could be picked up from the office just prior to the lesson and returned immediately after it. Some children could be responsible for counting the money at the beginning of the lesson and again just before it is returned to the office. The amount of money required depends on the size of the group, but generally these amounts and denominations would be adequate:

pennies:	100	($1.00)
nickels:	20	($1.00)
dimes:	20	($2.00)
quarters:	20	($5.00)
fifty-cent pieces:	10	($5.00)
dollar bills:	1	($1.00)

For $15.00, you have an excellent teaching device!

Play money can be used for some activities, such as those suggested under Written and Other Activities. Program Masters 8 to 14 make it possible for each child to make a personal set of play money. Of course this money can be used in any of the following activities.

Lesson

1

Seat the children around the working area. Display a dollar bill and ask for its value. Write one dollar and $1 on the easel. Discuss the kinds of things one dollar will buy.

2

Ask how many cents have a value of one dollar. Write 100¢ on the easel and explain that this is another way to record the same amount of money. Show 100 pennies and tell the children that the pennies have the same value as the dollar bill.

3

Show a nickel and ask a child to write its name and its value on the easel. Have a child count by fives to select the number of nickels that have a value of one dollar.

4

Repeat the preceding activity for dimes, quarters and half-dollars.

5

Write 50¢ on the easel and tell a child to select dimes and nickels to make a value of 50¢. Record this on the easel. Then have each of two other children select a different number of dimes and nickels having a value of 50¢. Explain that these are different ways of choosing coins to make 50¢.

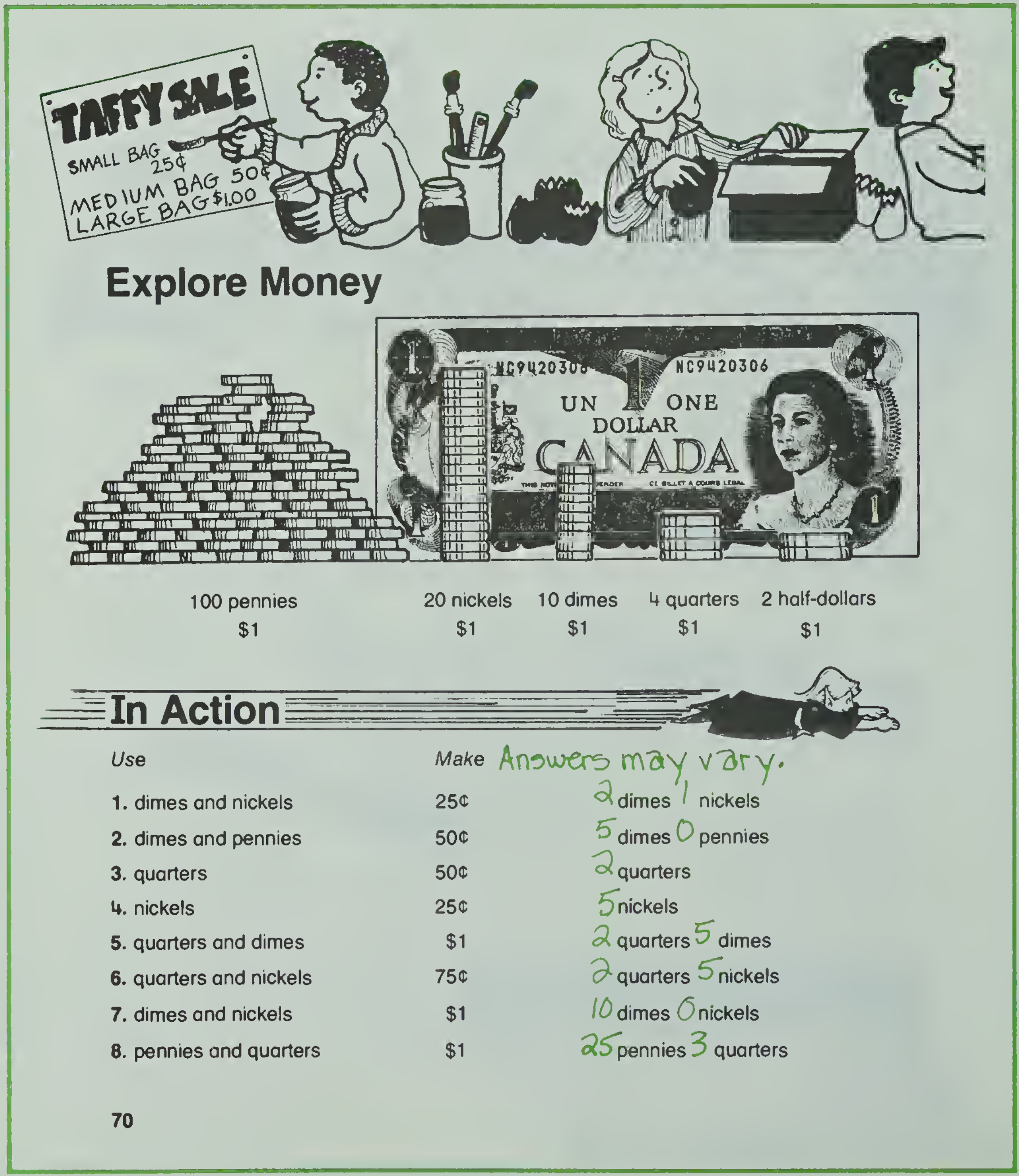
6

Repeat the preceding activity for instructions such as these:

Make 25¢ with nickels and pennies.
Make 75¢ with quarters and dimes.
Make $1 with half-dollars, dimes and nickels.

7

Display a few coins and have children find the value. Record the value on the easel. Repeat this activity several times.



Explore Money

100 pennies $1 — 20 nickels $1 — 10 dimes $1 — 4 quarters $1 — 2 half-dollars $1

In Action

Use	Make	Answers may vary.
1. dimes and nickels	25¢	2 dimes 1 nickels
2. dimes and pennies	50¢	5 dimes 0 pennies
3. quarters	50¢	2 quarters
4. nickels	25¢	5 nickels
5. quarters and dimes	$1	2 quarters 5 dimes
6. quarters and nickels	75¢	2 quarters 5 nickels
7. dimes and nickels	$1	10 dimes 0 nickels
8. pennies and quarters	$1	25 pennies 3 quarters

70

Written and Other Activities

☐

mathways 3, pages 70 and 71

Tell the children that there is more than one way of making the amounts in some of the questions.

☐ ☐

Compare the coins shown on page 71 with the real coins used in the lesson.

☐ ☐ ☐

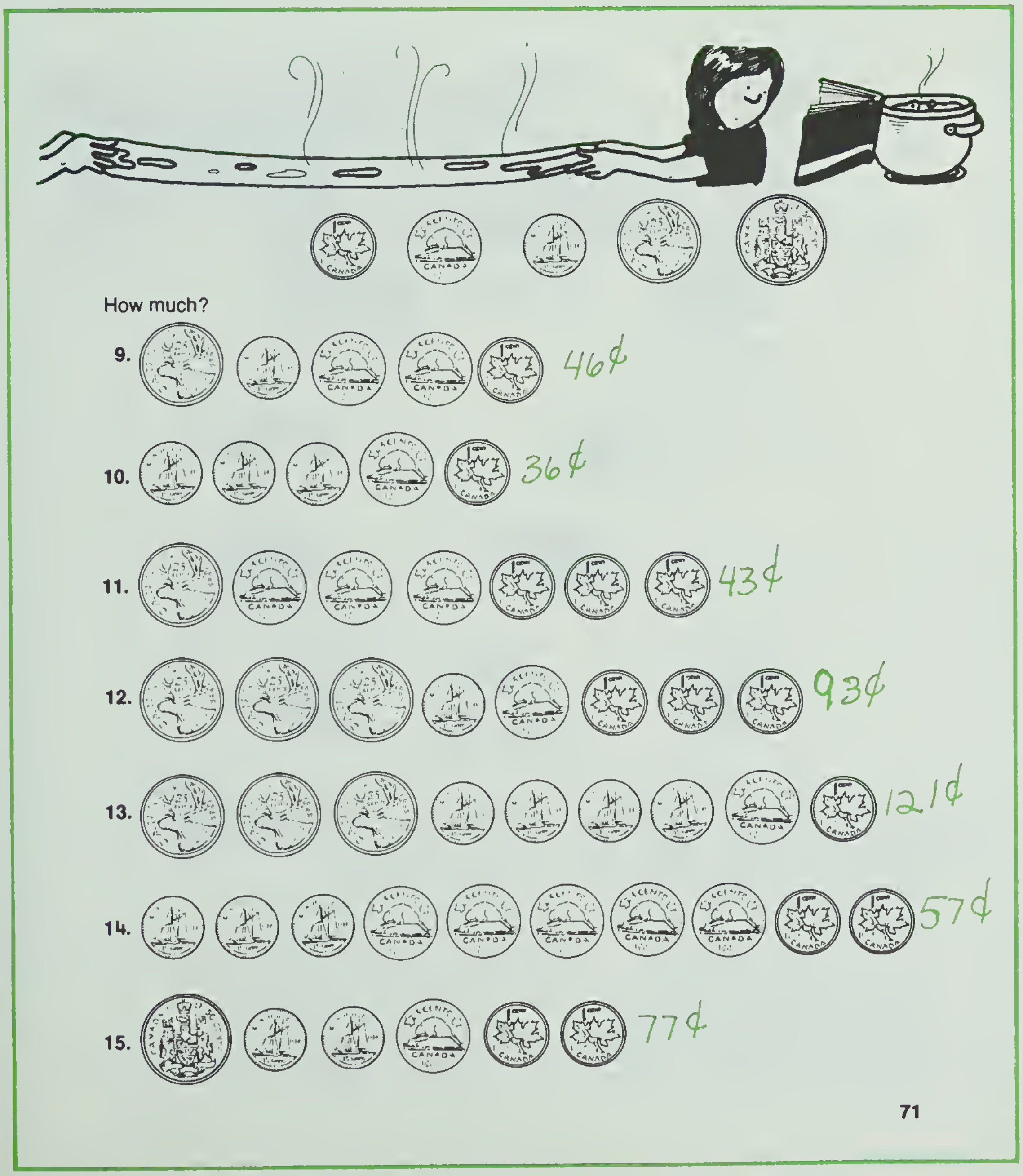
Set up a class bank with play money. A few children at a time can be given a selection of coins. Each child goes to the bank, tells the banker the value of the coins and asks for another, specific selection of coins having the same value.

☐ ☐ ☐ ☐

Have children work in pairs. They can take turns stating an amount of money for the other to select play coins with that value. Reverse this activity by having the children take turns displaying a few coins for the other to state the value.

☐ ☐ ☐ ☐ ☐

Write a few amounts of money on the board and have the children list as many combinations of coins as possible for each amount.



How much?

9. 46¢

10. 36¢

11. 43¢

12. 93¢

13. 121¢

14. 57¢

15. 77¢

71

☐ ☐ ☐ ☐ ☐ ☐

You may wish to send home a letter to keep parents informed of what is happening in the mathematics class. The following may serve as a model.

Dear Parent or Guardian;

It's Math note time again! We have been learning about money. If you read pages 70 to 73 of ***mathways 3****, you'll know that we have been having fun. Here are some ways that you can get involved. You'll need to have several of each of the coins – the more the better. It's even nice to have two or three fifty cent pieces. Your local bank will be helpful. Here are some things to try! Remember that the key words for any activity are SHORT, SUPPORTIVE, and FUN-filled.*

- *Put several coins of mixed variety out. Ask your child to tell you the total amount. Now ask to have that same amount of money shown using different coins. Repeat that activity as long as interest is high.*
- *Here is another idea. Collect several food or household items on which there is still a price tag. The individual amounts should be less than $1.00. Ask your child to use coins to show the amount being charged for each object. Each time, have the same amount shown different ways.*
- *A third idea is to make up some puzzles like those on page 73. These are really challenging! Don't make them too hard.*

Thanks for your help!

Unit 1 Section 8 Lesson 6

Exploring Money: Making Purchases

Materials

- 100 pennies, 20 nickels, 10 dimes, 4 quarters, 2 half-dollars and 1 dollar bill
- pencil, eraser, book, pen
- catalogues
- several pairs of scissors
- glue
- notebooks

Lesson

1

Gather the children around the working area and place the money in the centre.

Write this list on the easel.

Pencil	*35¢*
Eraser	*20¢*
Book	*55¢*
Pen	*80¢*

Ask a child to read the amounts of money. Have a child select the coins that can be used to buy a pencil. Record the selection on the easel. Ask other children to select different coins that can also be used to buy a pencil and record each of these on the easel. Point out that all these selections have the same value and any one could be used. Repeat the activity for other items on the list.

2

Ask a child to select the coins that can be used to buy a pencil and an eraser. The child may select the coins needed for each of these and put the coins together or add the amounts and select the coins required. Ask other children to select other sets of coins that could be used for this purchase. Record each on the easel, explaining that these are different ways to show the same amount. Repeat for other combinations of two items.

Written and Other Activities

☐

mathways 3, page 72

Each child can choose a meal or a few meals from the menu on page 72 and record the coins needed. They could select a few different combinations of coins.

☐ ☐

Have children cut from old catalogues pictures of objects that they find appealing. These objects might include clothing, toys, games and furniture for a child's bedroom. Glue the pictures in a notebook or on a bulletin board. Have the children record a price for each item beside the picture. You may wish to restrict the prices to amounts less than 50¢.

Next, have the children create shopping lists of items found in the catalogue. Children can select a shopping list, locate the items and find the total cost of the items on the list.

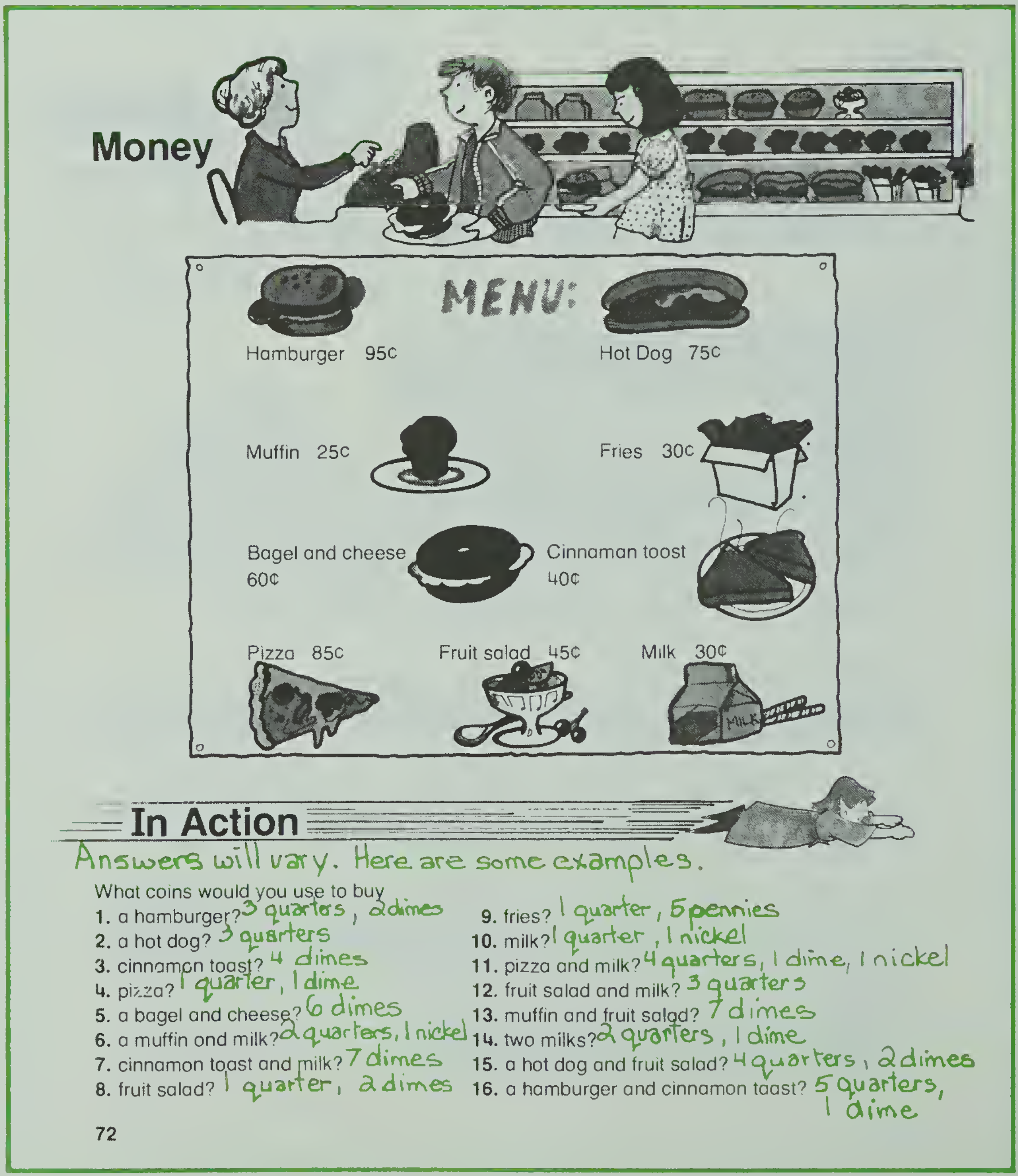
If the idea seems interesting and worthwhile, pair the children and have the whole class participate in making a number of catalogues. Encourage the students to organize their catalogues by putting like items together. They might want to write page numbers and make an index. They might also like to write descriptions of the items they select. In such ways, many other disciplines can be integrated with mathematics.

☐ ☐ ☐

mathways 3 Practice Masters page 14

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 19



Money

MENU:

Hamburger 95¢

Hot Dog 75¢

Muffin 25¢

Fries 30¢

Bagel and cheese 60¢

Cinnamon toast 40¢

Pizza 85¢

Fruit salad 45¢

Milk 30¢

In Action

Answers will vary. Here are some examples.

What coins would you use to buy

1. a hamburger? 3 quarters, 2 dimes
2. a hot dog? 3 quarters
3. cinnamon toast? 4 dimes
4. pizza? 1 quarter, 1 dime
5. a bagel and cheese? 6 dimes
6. a muffin and milk? 2 quarters, 1 nickel
7. cinnamon toast and milk? 7 dimes
8. fruit salad? 1 quarter, 2 dimes
9. fries? 1 quarter, 5 pennies
10. milk? 1 quarter, 1 nickel
11. pizza and milk? 4 quarters, 1 dime, 1 nickel
12. fruit salad and milk? 3 quarters
13. muffin and fruit salad? 7 dimes
14. two milks? 2 quarters, 1 dime
15. a hot dog and fruit salad? 4 quarters, 2 dimes
16. a hamburger and cinnamon toast? 5 quarters, 1 dime

72

Unit 1 Section 8 Lesson 7

PROBLEM SOLVING

Byway: Solving Word Problems Involving Money

Materials

- 100 pennies, 20 nickels, 10 dimes, 4 quarters and 2 half-dollars
- chart paper

Lesson

1

Gather the children around the working area. Display a chart with the following word problems.

I have two coins.
The coins are the same.
The total amount is 10¢
What are the two coins?

I have six coins.
Five coins are the same.
The total amount is 10¢
What are the six coins?

I have three coins.
No coins are the same.
The total value is 31¢
What are the three coins?

I have nine coins.
There are only two kinds of coins.
The total amount is 54¢
What are the nine coins?

I have three coins.
Two of the coins are the same.
The total amount is 70¢.
What are the three coins?

Place the coins in the centre of the working area. Read the first word problem and have a child choose the coins. Show the coins selected. Read the first sentence in the problem and discuss whether these coins satisfy it. Continue this for each of the next two sentences in the problem. Repeat this procedure for each of the other problems.

Written and Other Activities

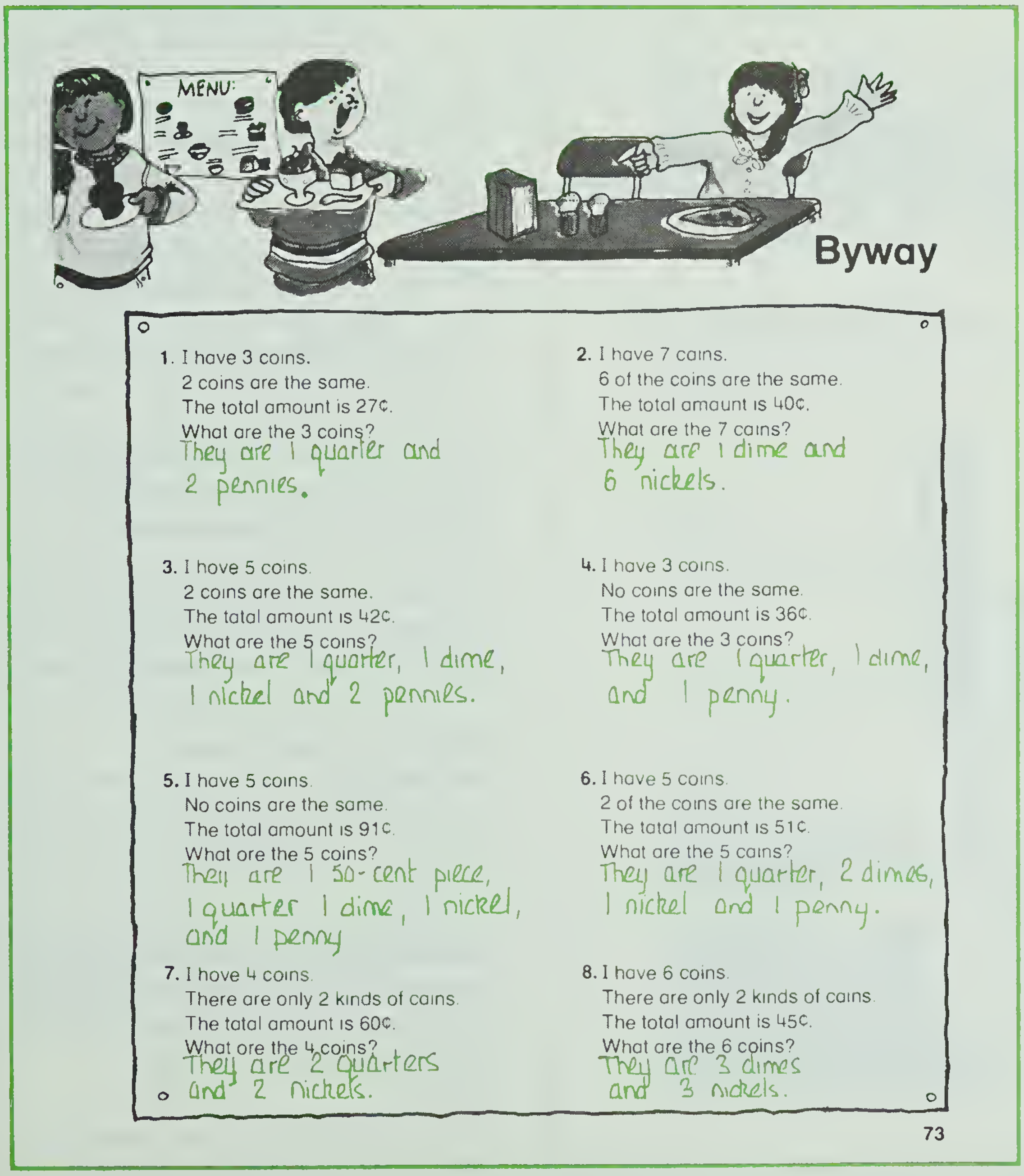
☐

mathways 3, page 73

Children may need to use real or play coins or draw coins to help them answer these problems.

☐ ☐

Challenge the children to create and solve word problems similar to those on page 73.



Byway

1. I have 3 coins.
2 coins are the same.
The total amount is 27¢.
What are the 3 coins?
They are 1 quarter and 2 pennies.

2. I have 7 coins.
6 of the coins are the same.
The total amount is 40¢.
What are the 7 coins?
They are 1 dime and 6 nickels.

3. I have 5 coins.
2 coins are the same.
The total amount is 42¢.
What are the 5 coins?
They are 1 quarter, 1 dime, 1 nickel and 2 pennies.

4. I have 3 coins.
No coins are the same.
The total amount is 36¢.
What are the 3 coins?
They are 1 quarter, 1 dime, and 1 penny.

5. I have 5 coins.
No coins are the same.
The total amount is 91¢.
What are the 5 coins?
They are 1 50-cent piece, 1 quarter 1 dime, 1 nickel, and 1 penny

6. I have 5 coins.
2 of the coins are the same.
The total amount is 51¢.
What are the 5 coins?
They are 1 quarter, 2 dimes, 1 nickel and 1 penny.

7. I have 4 coins.
There are only 2 kinds of coins.
The total amount is 60¢.
What are the 4 coins?
They are 2 quarters and 2 nickels.

8. I have 6 coins.
There are only 2 kinds of coins.
The total amount is 45¢.
What are the 6 coins?
They are 3 dimes and 3 nickels.

73

Unit 1 Section 9 Lesson 1

Interpreting Bar Graphs

Materials

- five cards
- graph paper
- for each child
  - – interlocking cube
  - – square of red paper
  - – glue

Rationale

Concrete graphs and pictographs are presented on pages 40, 41 and 42 of *mathways 3.* The skills acquired during those lessons on making and interpreting graphs can be reviewed and extended during the lessons on bar graphs on pages 74, 77 and 78. Suggestions for lessons and activities relate the different kinds of graphs, showing that the same information can be shown on a concrete graph, a pictograph or a bar graph.

Lesson

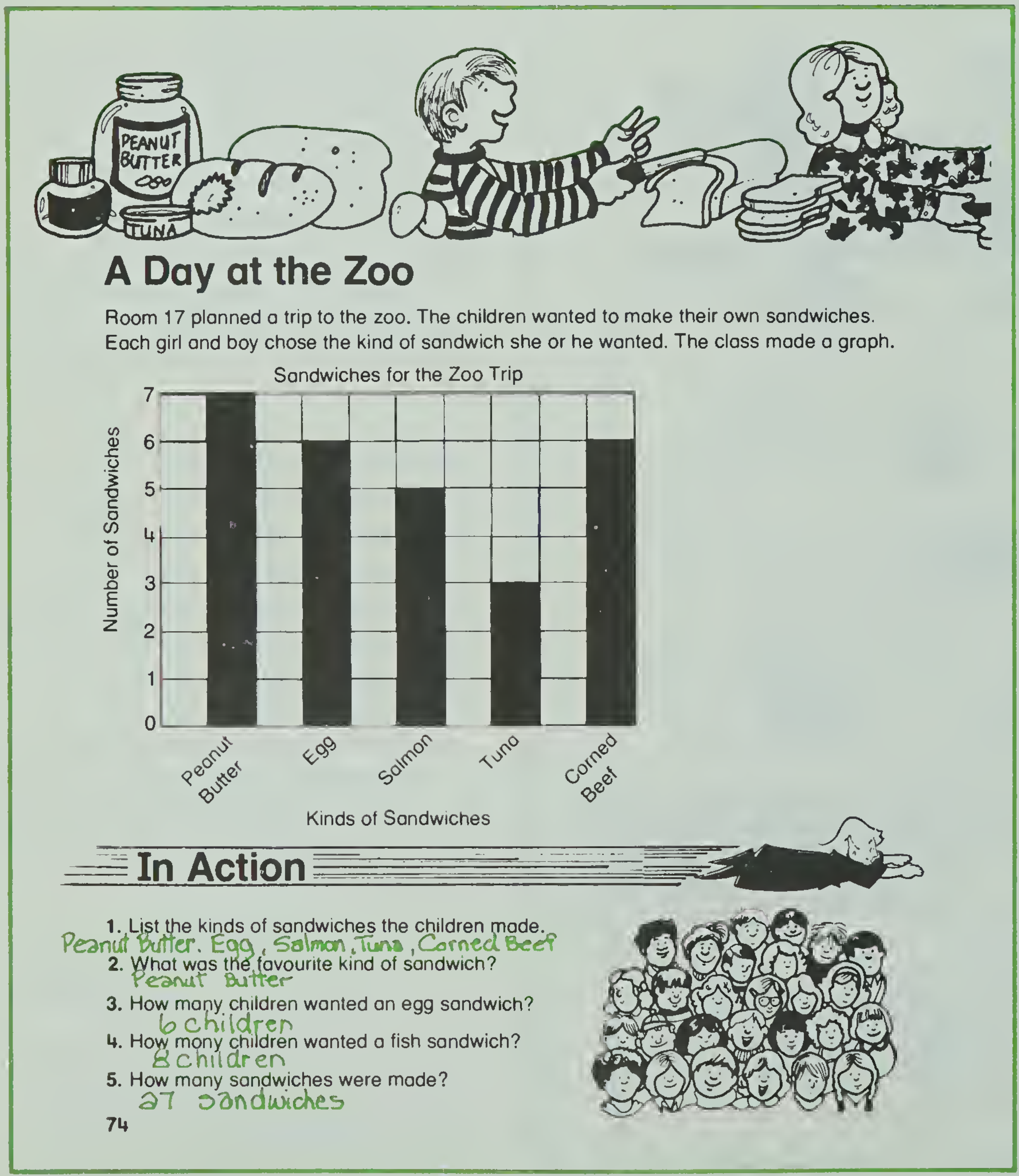
1

Gather the children into the working area. Ask the children to name five favourite kinds of sandwiches. Write the sandwich names on cards. Give each child an interlocking cube. Have each child stack the cube beside the name of a favourite kind of sandwich to build a concrete graph.

Talk about the graph, discussing the favourite kind of sandwich, the least popular kind of sandwich and so on.

2

On a large piece of graph paper draw and label the axes, as on *mathways 3* page 74, for a graph showing favourite kinds of sandwiches. Write on the graph paper the kinds of sandwiches named in the class's concrete graph. Give each child a square of red paper to glue beside the name of the sandwich chosen for the first graph.



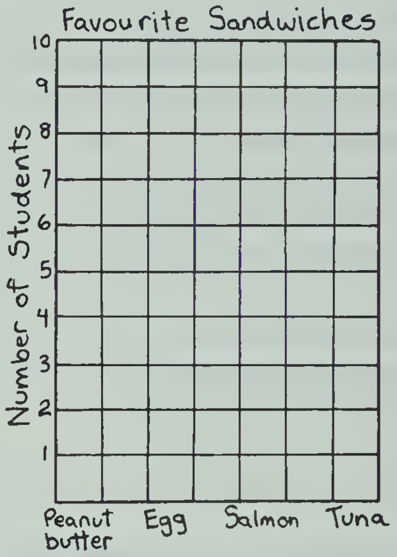
A Day at the Zoo

Room 17 planned a trip to the zoo. The children wanted to make their own sandwiches. Each girl and boy chose the kind of sandwich she or he wanted. The class made a graph.

In Action

1. List the kinds of sandwiches the children made.
Peanut Butter. Egg, Salmon, Tuna, Corned Beef
2. What was the favourite kind of sandwich?
Peanut Butter
3. How many children wanted an egg sandwich?
6 children
4. How many children wanted a fish sandwich?
8 children
5. How many sandwiches were made?
27 sandwiches

74



3

Compare the two graphs, emphasizing that they are two ways of showing the same information.

Ask questions such as these about the bar graph.

What is the kind of sandwich chosen by most children?

How many children like peanut butter sandwiches best?

4

Tell the children to name five kinds of food. Write these on the easel. Then have the children indicate their favourite food by raising a hand when its name is read. Record the number of children who choose each food. Have each child make a bar graph to show this information.

Written and Other Activities

☐

mathways 3, page 74

☐ ☐

Each child can make a pictograph or a concrete graph to show the same data as the graph on page 74. This would allow them the opportunity to compare the different kinds of graphs.

☐ ☐ ☐

Have each child write and answer three other questions for the graph.

Unit 1 Section 9 Lesson 2

Choosing Addition or Subtraction to Solve Word Problems

Materials

- for each child
  - – sheet of paper

Lesson

1

Write the following on the easel:

8 lions
7 monkeys

Ask a child

What would you do to find the number of animals?

Discuss the reason for using addition. Then ask

What would you do to find how many more lions there are than monkeys?

Discuss the reason for using subtraction. Use several other examples.

Written and Other Activities

☐

mathways 3, page 75

The questions require the children to decide what operation to use to solve the problem. Some children may require help for question 7.

Ask one child to read the first problem. Have another child tell the same problem without reading it. Discuss how the children will discover how many lunches there are. Discuss why addition is the correct operation to use. Repeat for each of the other operations.

☐ ☐

Have the children write the name of the operations used to solve questions 1 to 5 and then explain orally the reason for each decision.

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Have each child in the group create a problem like question 6. Have the group solve each problem.

☐ ☐ ☐ ☐

Have each child in the group select items for lunch from the menu on page 75. Have each one calculate the total cost of the selected items.

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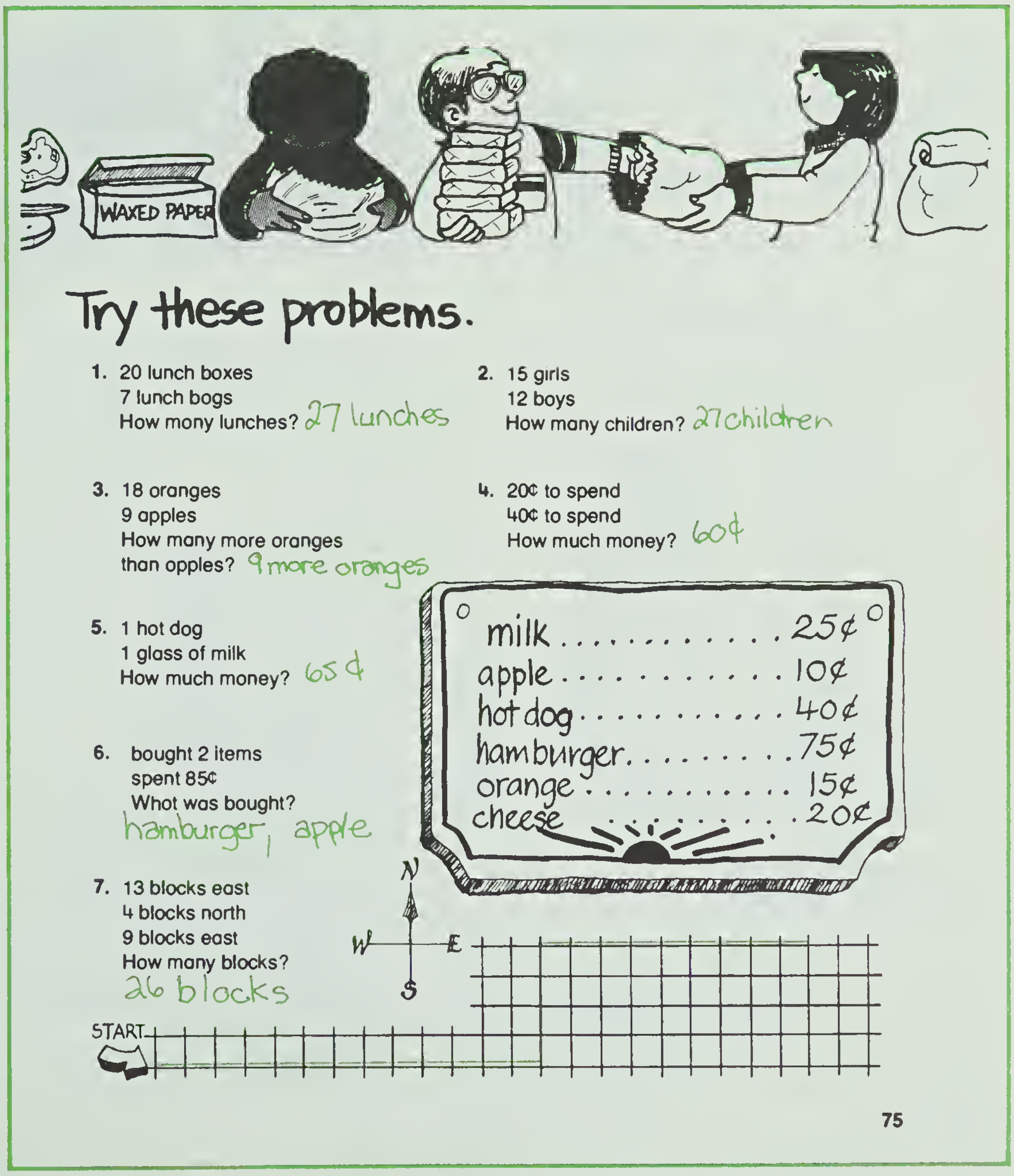
Ask each child to create a menu similar to the one illustrated on page 75. Have each of the children include her or his favourite snack foods. Have them price each of the items under 75¢.

Have each child create three problems of the same type as on page 75. These problems could be written under the menu on chart paper. They could be displayed or used for further problem solving.

Menu

Peanut butter sandwich	50¢
apple	20¢
banana	15¢
orange	25¢
milk	30¢
chocolate chip cookie	10¢


WAXED PAPER
N
W
E
S
START

Try these problems.

1. 20 lunch boxes
   7 lunch bags
   How many lunches? 27 lunches

2. 15 girls
   12 boys
   How many children? 27children

3. 18 oranges
   9 apples
   How many more oranges than apples? 9 more oranges

4. 20¢ to spend
   40¢ to spend
   How much money? 60¢

5. 1 hot dog
   1 glass of milk
   How much money? 65¢

6. bought 2 items
   spent 85¢
   What was bought?
   hamburger, apple

7. 13 blocks east
   4 blocks north
   9 blocks east
   How many blocks?
   26 blocks

milk	25¢
apple	10¢
hot dog	40¢
hamburger	75¢
orange	15¢
cheese	20¢

75

Unit 1 Section 9 Lesson 3

Choosing Addition or Subtraction to Solve Word Problems

Materials

- pictures of zoo animals
- old magazines

Lesson

1

Display the pictures of zoo animals. Ask the children to think of addition and subtraction word problems about animals at the zoo. Have several children state their problems for others to name the operation required and give the answer.

Written and Other Activities

☐

mathways 3, page 76

Have a child read the first problem aloud.

Tell the problem in your own words, please, Ken.

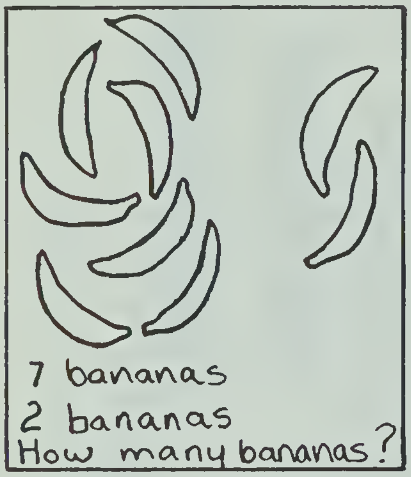
Tell another problem like this one, please, Jean.

What operation will you use to solve the problem?

Repeat for each problem on the page.

☐ ☐

Have the children illustrate a few of the problems on page 76.



7 bananas
2 bananas
How many bananas?

☐ ☐ ☐

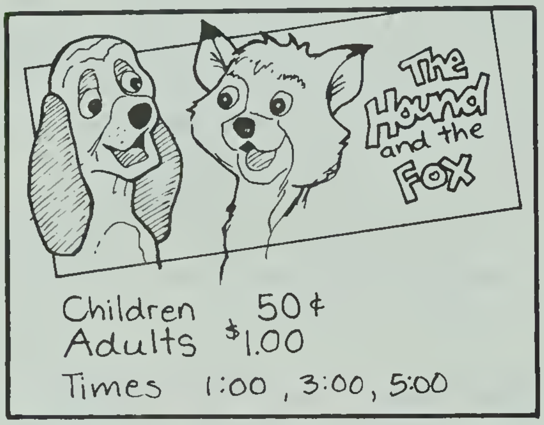
Children can create word problems for others to solve.

50¢ to go to the zoo
30¢ for food
How much money?

☐ ☐ ☐ ☐

Provide each child with an old magazine. Have the children locate and cut out pictures from which word problems can be created.

In turn, have the children show a picture and state a problem. Other children tell the operation required to solve the problem and give the answer.



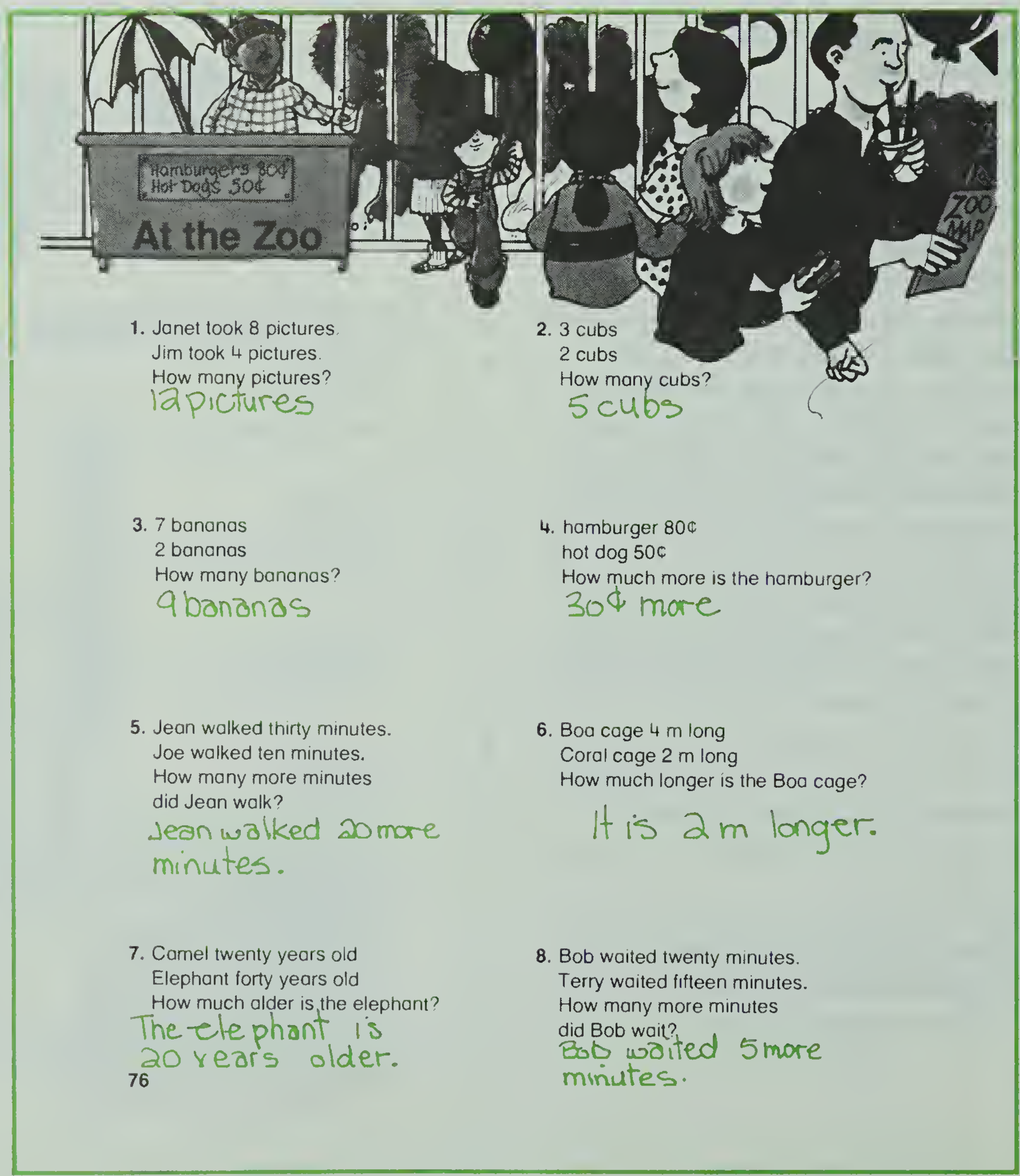
☐ ☐ ☐ ☐ ☐

Have the children look at the information given in each problem situation and use that information to create other problems.

Janet took 8 pictures.
Jim took 4 pictures.
How many more pictures did Janet take?

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 20



1. Janet took 8 pictures.
   Jim took 4 pictures.
   How many pictures?
   12 pictures

2. 3 cubs
   2 cubs
   How many cubs?
   5 cubs

3. 7 bananas
   2 bananas
   How many bananas?
   9 bananas

4. hamburger 80¢
   hot dog 50¢
   How much more is the hamburger?
   30¢ more

5. Jean walked thirty minutes.
   Joe walked ten minutes.
   How many more minutes did Jean walk?
   Jean walked 20 more minutes.

6. Boa cage 4 m long
   Coral cage 2 m long
   How much longer is the Boa cage?
   It is 2 m longer.

7. Camel twenty years old
   Elephant forty years old
   How much older is the elephant?
   The elephant is 20 years older.

8. Bob waited twenty minutes.
   Terry waited fifteen minutes.
   How many more minutes did Bob wait?
   Bob waited 5 more minutes.

76

Unit 1 Section 9 Lesson 4

Interpreting Bar Graphs

Materials
- graph paper
- glue
- for each child
  - squares of red paper

Lesson
1

On a large piece of graph paper draw and label the axes for a bar graph like the one shown on page 77, and display it on the easel. Gather the children around and tell them to decide which of the animals named on the graph is their favourite. Read the word *lion* and tell the children who choose it as their favourite to raise their hands. Beside the word lion, have each child who chooses that animal glue a square of red paper. Repeat this for each animal on the graph to complete the bar graph. Ask questions such as the following:

What does each square on the graph stand for?
How many children chose zebras?
What animal did the greatest number of children choose?
How many more children chose gorillas than monkeys?

Written and Other Activities
☐

mathways 3, page 77

Discuss the title of the graph. Discuss the meaning of the numbers on the vertical axis.

Have a child read the first question. Discuss an appropriate written response. Ask the children to each silently read the remaining questions. Provide any assistance necessary.

☐ ☐

Have each child write and answer three other questions for the graph on page 77.

Such questions might be:

Which animal was enjoyed by the same number of children as the lion was?
Which animal was enjoyed by the fewest children?

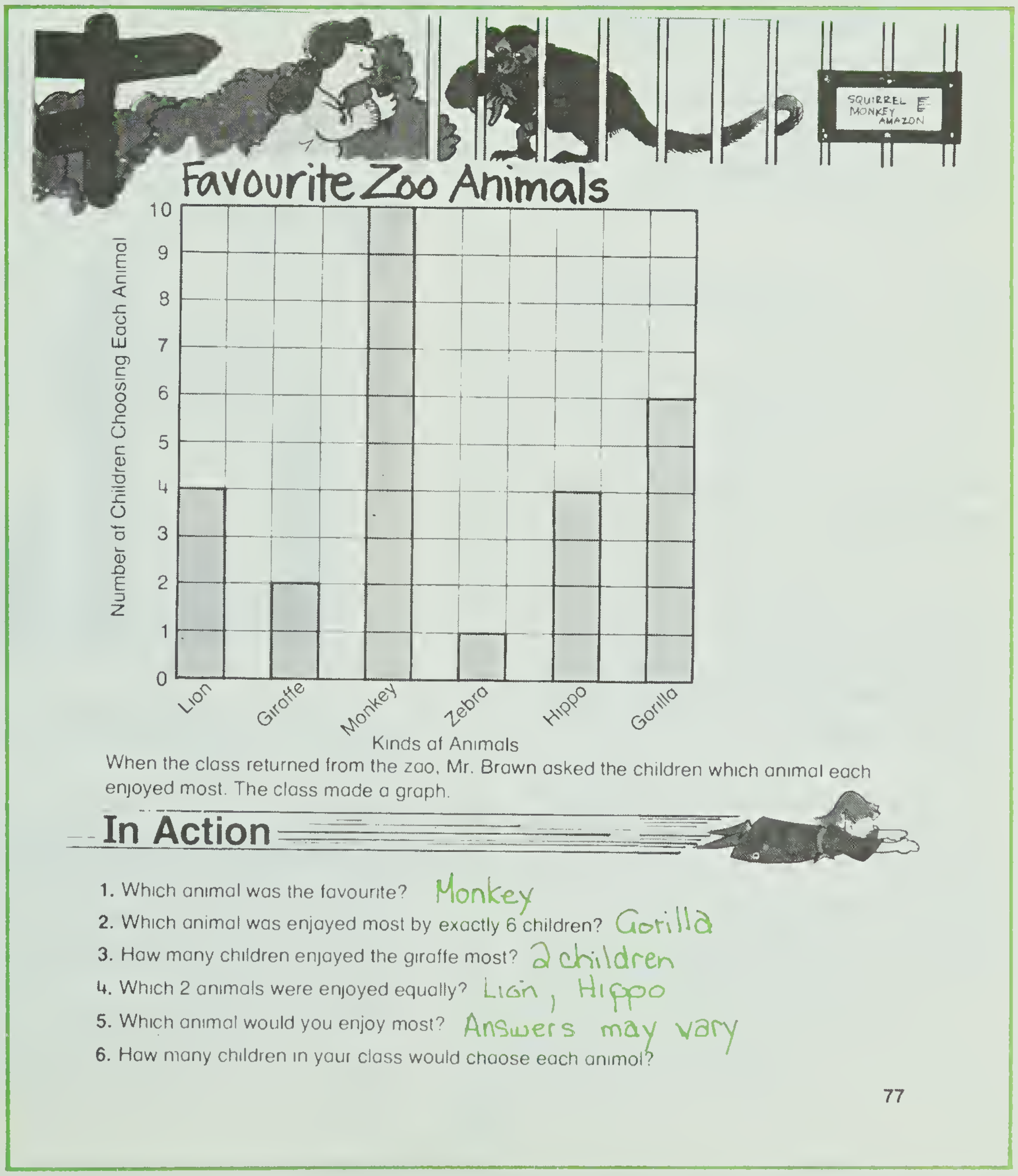
☐ ☐ ☐

Help the children make pictographs or bar graphs about one of their class trips. They can choose different aspects of the trip to provide a variety in the graphs. Displaying these graphs would give the children a chance to compare different graphs.

☐ ☐ ☐ ☐

Compare the graph on page 77 with the one prepared during the lesson. The children can use their class graph to answer question 6.

Compare, for example, the number of children in Mr. Brown's class who enjoyed the lion the most with the number of children in your class who enjoyed the lion the most.



When the class returned from the zoo, Mr. Brown asked the children which animal each enjoyed most. The class made a graph.

In Action

1. Which animal was the favourite? Monkey
2. Which animal was enjoyed most by exactly 6 children? Gorilla
3. How many children enjoyed the giraffe most? 2 children
4. Which 2 animals were enjoyed equally? Lion, Hippo
5. Which animal would you enjoy most? Answers may vary
6. How many children in your class would choose each animal?

77

Unit 1 Section 9 Lesson 5

Interpreting Bar Graphs

Materials
- graph paper
- marker

Lesson
1

Seat the children around the working area. On the easel display a graph with axes drawn and labelled for a bar graph like the one on *mathways 3* page 78. Encourage the children to comment on the activities suggested on the graph. Ask them to decide which activity they would choose to do on returning from a trip to the zoo.
Read the word *story* and have the children who would choose to write a story raise their hands. Using the marker, colour a square to represent each child who would choose this activity. A discussion such as this would be useful.
Fred would choose to write a story. This square represents Fred's choice. Maria would choose to write a story. Here is her square.
. . . and so on.
Repeat for each activity to complete the bar graph, pointing out how the squares are lined up.
Have the children ask questions about the graph for others to answer.

Written and Other Activities
☐

mathways 3, page 78

Divide the class into groups of three. The children can take turns asking the others in the same group questions about the graph.

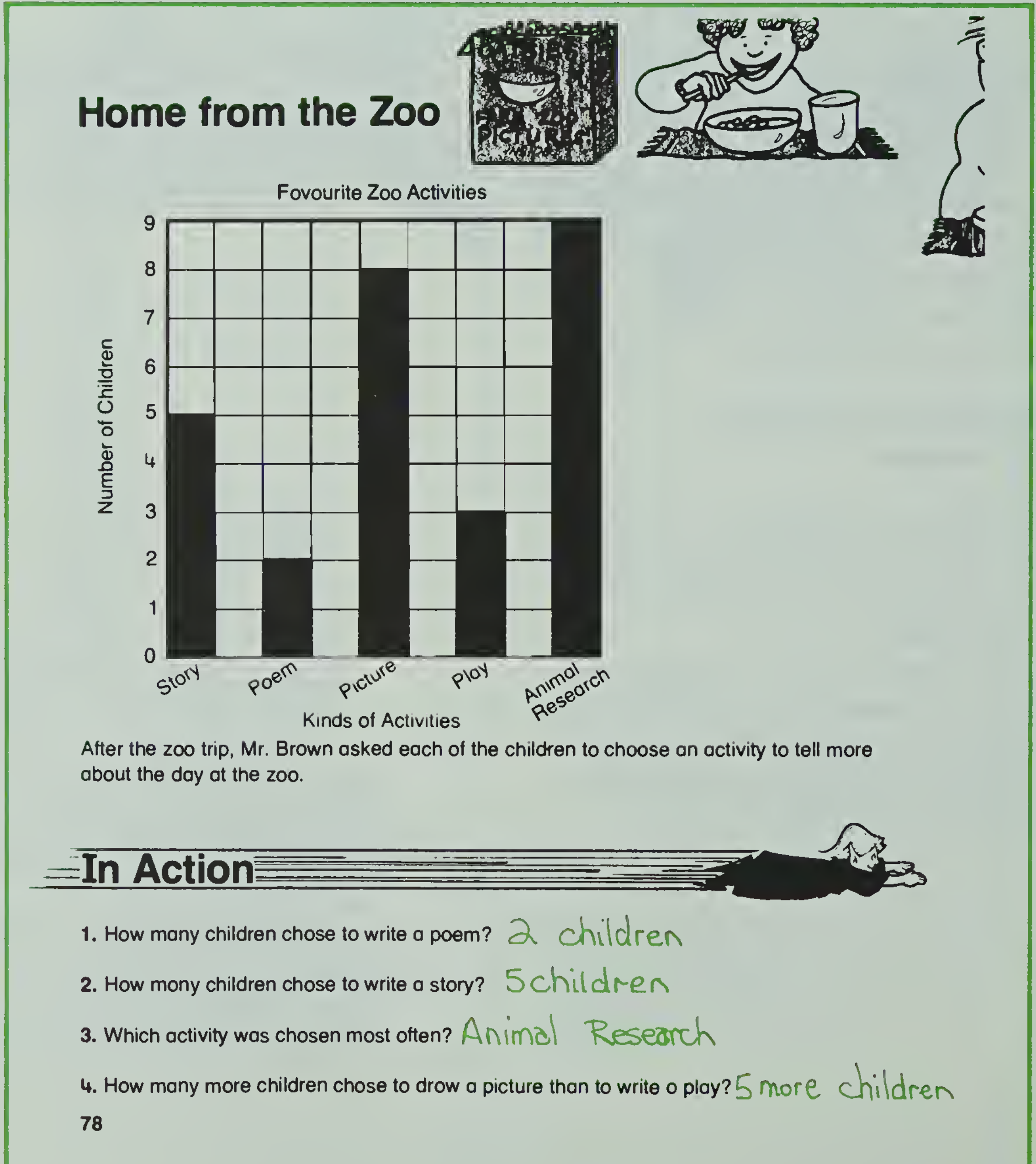
☐ ☐

Compare the graph on page 78 with the one made by the children in the lesson.

☐ ☐ ☐

mathways 3 Practice Masters page 15

For Your Notes



Home from the Zoo

Fovourite Zoo Activities
Number of Children
0
1
2
3
4
5
6
7
8
9
Story
Poem
Picture
Play
Animal Research
Kinds of Activities

After the zoo trip, Mr. Brown asked each of the children to choose an activity to tell more about the day at the zoo.

In Action

1. How many children chose to write a poem? 2 children
2. How mony children chose to write a story? 5 children
3. Which activity was chosen most often? Animal Research
4. How many more children chose to drow a picture than to write o play? 5 more children

78

Unit 1 Section 9 Lesson 6

Sorting: Discovering Sorting Rules

Materials

- items for sorting: attribute pieces, pictures of toys, or school supplies
- magazines
- several pairs of scissors
- box

Rationale

Sorting is a problem-solving skill that helps develop logical thinking. It provides practice in arranging things according to categories and in selecting the categories. Also, sorting the same set of items in different ways helps children realize that there is more than one way to approach a situation. For example, when collecting and organizing information for graphs, it is necessary to list the categories and then sort the information into these categories.

Lesson

1

Gather the children into the working area. Display one kind of item and have a child sort the items into two groups. Then ask the child how he or she decided which group each item belonged in. Have other children sort the items into two different groups and explain the difference between the two groups. Discuss how one group of items can be sorted in different ways. Attribute pieces can be sorted according to shape, size, or colour. Pictures of toys can be sorted according to colour, the use of the toys, the size of the toys, where the toys would be stored, whether the toys can be used for games, or whether the child sorting the pictures likes the toys or not. Repeat this activity for the other kinds of items.

2

Write several words on the easel for the children to sort into groups. The number of groups can be specified or each child can decide on the number of groups. Children may sort the words according to the number of letters in the words, the number of vowels in the words, the number of syllables in the words, or the meaning of the words.

3

Write several numerals on the easel for the children to sort into groups. The groups may be determined by whether the numbers are odd or even, whether they would be said when counting by twos beginning with two, whether they are less than 100 or greater than 100, the number of digits in the numerals, or according to the last digit in each numeral.

Written and Other Activities

☐

mathways 3, page 79

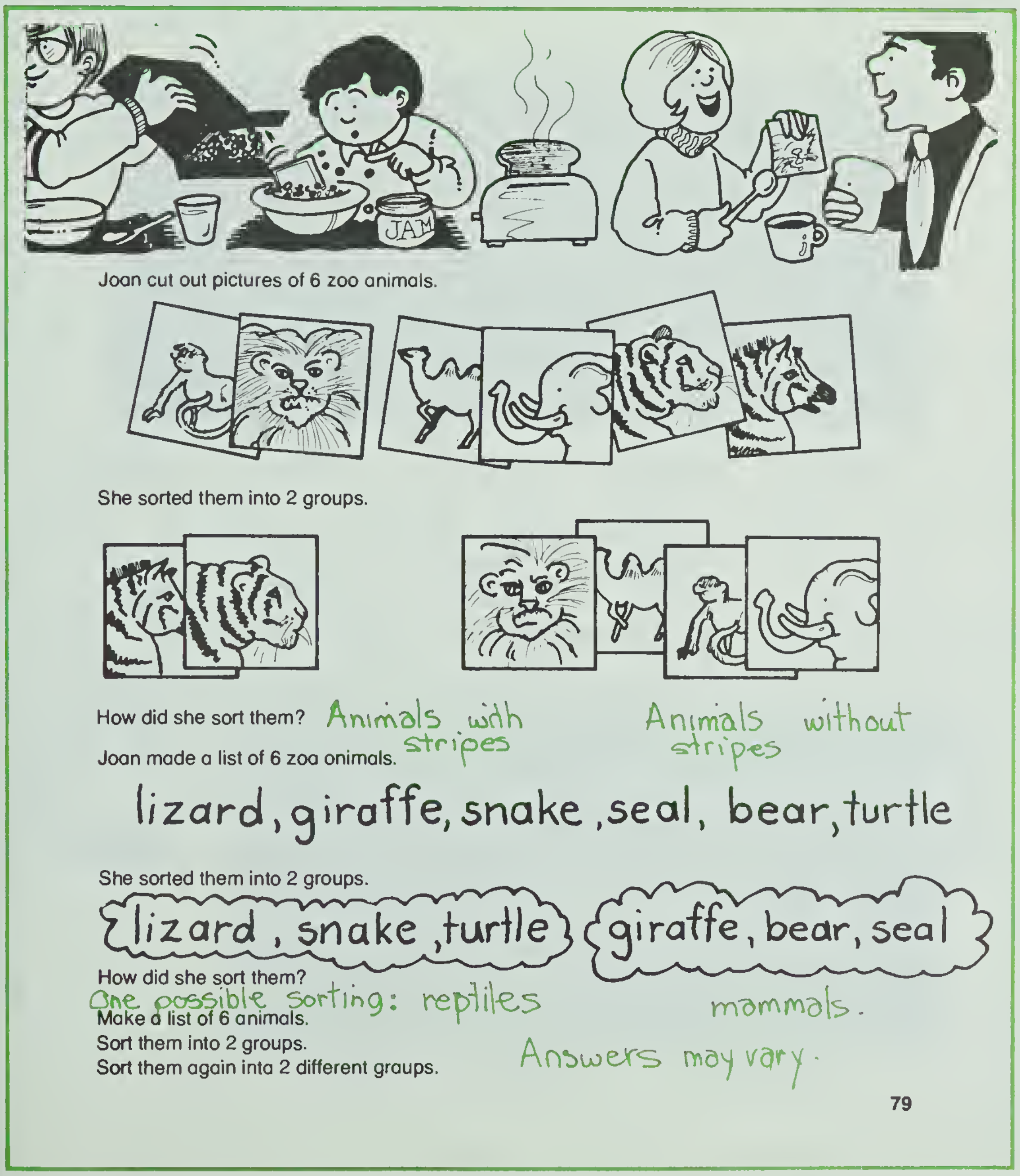
Encourage the children to comment on how Joan sorted the animals. After the children have completed the exercises on the page, ask a few to explain how they sorted the animals.

☐ ☐

Provide attribute pieces for a child to sort into two or more different groups. Then have the child explain the reason for the groups.

☐ ☐ ☐

Have children cut several pictures from magazines or have each child draw a picture. Place these pictures in a box. Have each child take 10 pictures and sort them into groups. One child can show another the groups of pictures and ask the other to explain how they were sorted.



Joan cut out pictures of 6 zoo animals.

She sorted them into 2 groups.

How did she sort them? Animals with stripes   Animals without stripes

Joan made a list of 6 zoo animals.

lizard, giraffe, snake, seal, bear, turtle

She sorted them into 2 groups.

lizard, snake, turtle   giraffe, bear, seal

How did she sort them?

One possible sorting: reptiles   mammals.

Make a list of 6 animals.

Sort them into 2 groups.

Sort them again into 2 different groups.

Answers may vary.

79

Unit 1 Section 9 Lesson 7

Solving Word Problems Involving Time and Money; Multiplying and Dividing by One to Five

Materials

- model clock

Lesson

1

Draw a chart such as this one on the easel.

Museum	
Opening time	9:00
Closing time	5:30
Film times	10:30 1:00 2:30
Adults	$2.00
Senior Citizens	$1.50
12 and under	$1.50
Ages 5-11	$ .50
Under 5	Free

Record several questions under the chart. Discuss with the children that the information for answering these questions is contained in the chart. Have the children locate the information necessary for completing each question.

2

Seat the children around the working area and display the model clock. Pose a word problem.

Martha went to the zoo at 11:00 A.M. and left at 11:30 A.M. How long did she stay?

Have the children use the model clock to check the answer. Use a few other similar problems. Invite children to make up problems for the group to solve.

3

Write $3 and $3.00 on the easel and have a child read each. Point out that both of these expressions show the same amount of money. Ask a child to write four dollars on the easel in two ways. Then present word problems involving these and other amounts of money for the group to solve. Invite children to make up and solve similar problems.

Written and Other Activities

☐

mathways 3, page 80

Discuss the chart at the top of the page and have a child read it aloud. Explain the way the questions and the puzzle at the bottom of the page are written, reviewing the symbols for multiplication and division.

☐ ☐

Have the children write and solve other word problems, using the chart at the top of page 80.

☐ ☐ ☐

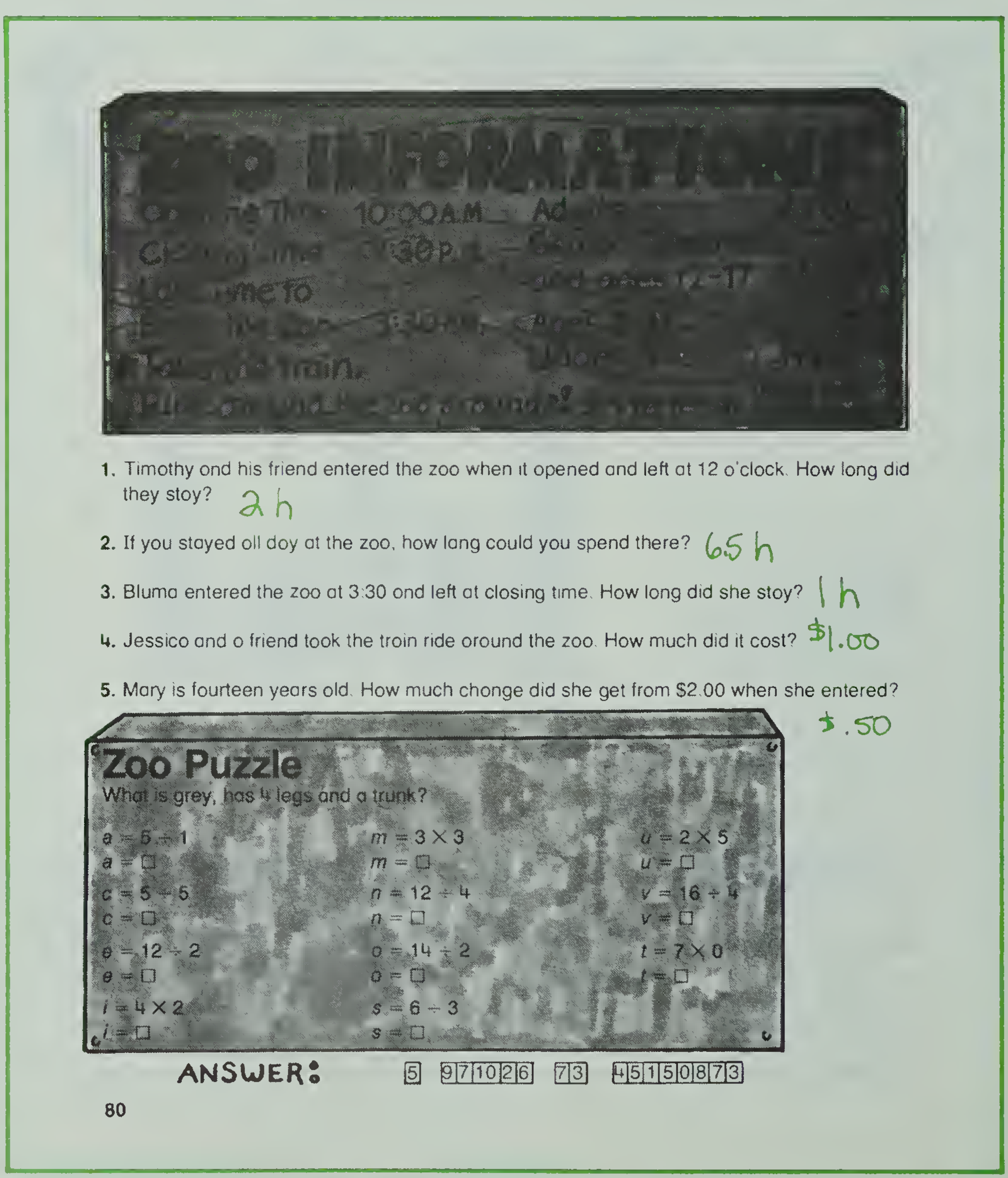
Have each child find the total cost of a family trip to the zoo. Compare the differences in the total cost of the outing resulting from different numbers of members in the children's families.

☐ ☐ ☐ ☐

mathways 3 Tests 4A, 4B

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 21



1. Timothy ond his friend entered the zoo when it opened and left at 12 o'clock. How long did they stoy? 2 h
2. If you stayed oll doy at the zoo, how long could you spend there? 6.5 h
3. Blumo entered the zoo at 3:30 ond left at closing time. How long did she stoy? 1 h
4. Jessico and o friend took the troin ride oround the zoo. How much did it cost? $1.00
5. Mary is fourteen years old. How much chonge did she get from $2.00 when she entered? $ .50

Zoo Puzzle

What is grey, has 4 legs and a trunk?

a = 5 ÷ 1
a = □
c = 5 ÷ 5
c = □
e = 12 ÷ 2
e = □
i = 4 × 2
i = □

m = 3 × 3
m = □
n = 12 ÷ 4
n = □
o = 14 ÷ 2
o = □
s = 6 ÷ 3
s = □

u = 2 × 5
u = □
v = 16 ÷ 4
v = □
t = 7 × 0
t = □

ANSWER: 5 9 7 10 2 6 7 3 4 5 1 5 0 8 7 3

80

Unit 1, Check 1

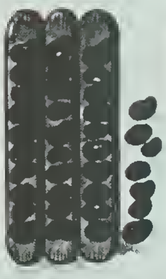
1.	2.	3.	4.	5.	6.	7.	8.
6	10	7	11	7	12	6	4
+ 0	− 7	+ 5	− 10	+ 3	7	+ 7	+ 7
6	3	12	1	10	5	13	11

9.	10.	11.	12.	13.	14.	15.	16.
6	8	14	6	13	6	14	9
+ 5	+ 5	5	- 5	− 9	+ 8	− 3	+ 5
11	13	9	1	4	14	11	14

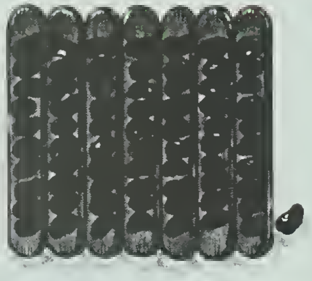
17.	18.	19.	20.	21.	22.	23.	24.
6	12	11	3	13	10	14	14
+ 4	− 4	9	+ 9	− 5	4	− 9	− 11
10	8	2	12	8	6	5	3

Write the numeral.

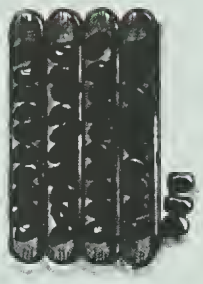
25.



26.



27.



Write the numeral

28. 2 tens and 3 23
29. 8 tens and 1 81
30. 9 tens and 8 98
31. 6 tens and 0 60
32. 4 tens and 5 45
33. 1 ten and 1 11

Write the number of tens and ones

34. 36 3tens + 6
35. 24 2tens + 4
36. 80 8 tens + 0
37. 62 6tens + 2
38. 53 5tens + 3
39. 29 2 tens + 9
40. 15 1 ten + 5
41. 45 4 tens + 5
42. 77 7 tens + 7
43. 20 2 tens + 0
44. 51 5 tens + 1
45. 90 9 tens

Write the numeral to show 1 more

46. 7 tens and 9 80
47. 8 tens 81
48. 1 ten and 9 20
49. 6 tens and 3 64

Unit 1, Practice 1

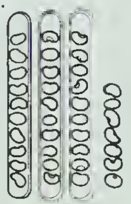
1.	2.	3.	4.	5.	6.	7.	8.
5	8	17	14	9	13	9	15
+ 9	+ 5	− 9	− 9	+ 8	− 0	+ 6	− 9
14	13	8	5	17	13	15	6

9.	10.	11.	12.	13.	14.	15.	16.
13	8	12	7	11	8	17	12
− 6	+ 7	− 7	+ 9	− 7	+ 6	− 7	− 12
7	15	5	16	4	14	10	0

17.	18.	19.	20.	21.	22.	23.	24.
8	10	15	13	16	7	9	14
+ 9	− 3	− 8	− 9	− 9	+ 6	+ 0	− 1
17	7	7	4	7	13	9	13

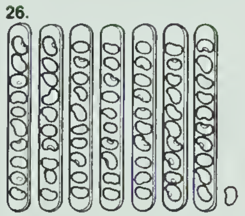
Write the numeral.

25.



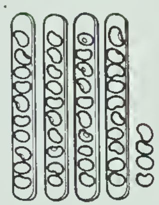
37

26.



71

27.



44

Write the numeral.

28. 3 tens and 5
29. 5 tens and 0
30. 7 tens and 9
31. 8 tens and 2
32. 1 ten and 9
33. 3 tens and 0

Write the number of tens and ones.

34. 25 2tens + 5
35. 67 6tens + 7
36. 95 9tens + 5
37. 83 8tens + 3
38. 42 4tens + 2
39. 56 5 tens + 6
40. 74 7tens + 4
41. 13 1 tens + 3
42. 38 3tens + 8
43. 63 6tens + 3
44. 24 2tens + 4
45. 50 5 tens

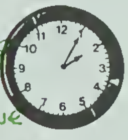
Write the numeral to show 1 more.

46. 9 tens 91
47. 6 tens and 9 70
48. 2 tens and 3 24
49. 5 tens 51

Unit 1, Check 2

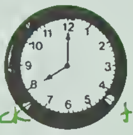
Write each time 2 ways.

1.



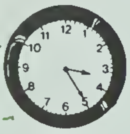
2:05 two o'five

2.



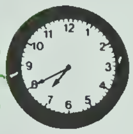
8:00 eight o'clock

3.



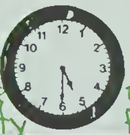
4:25 four twenty-five

4.



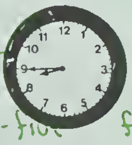
7:40 seven forty

5.



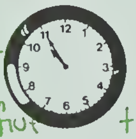
5:30 five thirty

6.



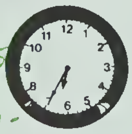
8:45 eight forty-five

7.

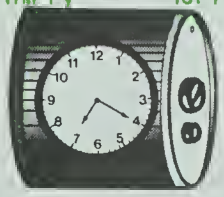


10:55 ten fiftyfive

8.



6:35 six thirty-five



Write the time.

9. 10 min later 7:36
10. 15 min earlier 7:05
11. 20 min earlier 7:00
12. 30 min later 7:50
13. 40 min later 8:00
14. 10 min earlier 7:10
15. 5 min earlier 7:15
16. 25 min later 7:45

17.	18.	19.	20.	21.	22.	23.	24.
18	9	8	16	9	18	14	8
− 7	+ 8	+ 5	− 9	+ 5	− 6	− 9	+ 4
11	17	13	7	14	12	5	12

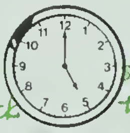
25.	26.	27.	28.	29.	30.	31.	32.
5	15	6	15	14	8	16	18
+ 8	− 9	+ 9	− 7	− 6	+ 7	− 7	− 8
13	6	15	8	8	15	9	10

33.	34.	35.	36.	37.	38.	39.	40.
9	18	8	14	4	9	15	7
+ 6	− 9	+ 3	− 8	+ 8	+ 7	− 8	+ 6
15	9	11	6	12	16	7	13

Unit 1, Practice 2

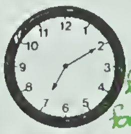
What time is it? Write each time 2 ways

1.



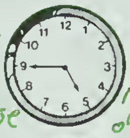
5:00 five o'clock

2.



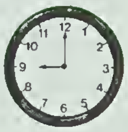
7:10 seven ten

3.



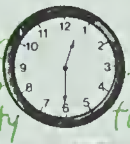
4:45 four forty-five

4.



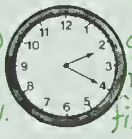
9:00 nine o'clock

5.



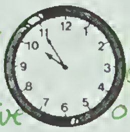
12:30 twelve thirty

6.



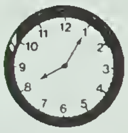
2:20 two twenty.

7.

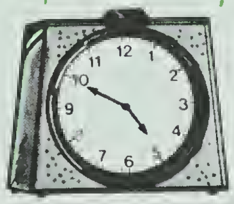


9:55 nine fifty-five

8.



8:05 eight-o-five



Write the time

9. 5 min earlier 4:45
10. 5 min later 4:55
11. 10 min later 5:00
12. 50 min earlier 4:00
13. 20 min earlier 4:30
14. 15 min later 5:05
15. 20 min later 5:10
16. 15 min earlier 4:35

Complete

17.	18.	19.	20.	21.	22.	23.	24.
7	18	17	9	16	18	6	7
+ 6	7	− 13	+ 8	8	9	+ 9	+ 7
13	11	4	17	8	9	15	14

25.	26.	27.	28.	29.	30.	31.	32.
17	16	9	5	17	7	18	3
9	9	+ 5	+ 8	11	+ 9	6	+ 8
8	7	14	13	6	15	12	11

33.	34.	35.	36.	37.	38.	39.	40.
7	4	15	5	7	14	6	15
+ 9	+ 9	9	+ 9	+ 8	− 9	+ 8	8
16	13	6	14	15	5	14	7

Unit 1, Check 3

Multiply.

1. $\begin{array}{r} 0 \\ \times 2 \\ \hline 0 \end{array}$ 2. $\begin{array}{r} 5 \\ \times 3 \\ \hline 15 \end{array}$ 3. $\begin{array}{r} 4 \\ \times 4 \\ \hline 16 \end{array}$ 4. $\begin{array}{r} 4 \\ \times 1 \\ \hline 4 \end{array}$ 5. $\begin{array}{r} 3 \\ \times 4 \\ \hline 12 \end{array}$ 6. $\begin{array}{r} 2 \\ \times 3 \\ \hline 6 \end{array}$ 7. $\begin{array}{r} 2 \\ \times 4 \\ \hline 8 \end{array}$ 8. $\begin{array}{r} 0 \\ \times 5 \\ \hline 0 \end{array}$

9. $\begin{array}{r} 1 \\ \times 5 \\ \hline 5 \end{array}$ 10. $\begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array}$ 11. $\begin{array}{r} 4 \\ \times 2 \\ \hline 8 \end{array}$ 12. $\begin{array}{r} 4 \\ \times 5 \\ \hline 20 \end{array}$ 13. $\begin{array}{r} 1 \\ \times 0 \\ \hline 0 \end{array}$ 14. $\begin{array}{r} 5 \\ \times 3 \\ \hline 15 \end{array}$ 15. $\begin{array}{r} 5 \\ \times 5 \\ \hline 25 \end{array}$ 16. $\begin{array}{r} 1 \\ \times 3 \\ \hline 3 \end{array}$

Divide.

17. 12 ÷ 4 = 3 18. 8 ÷ 2 = 4 19. 20 ÷ 5 = 4 20. 12 ÷ 3 = 4
21. 10 ÷ 5 = 2 22. 4 ÷ 4 = 1 23. 25 ÷ 5 = 5 24. 15 ÷ 3 = 5
25. 6 ÷ 2 = 3 26. 10 ÷ 2 = 5 27. 9 ÷ 3 = 3 28. 4 ÷ 2 = 2
29. 3 ÷ 3 = 1 30. 20 ÷ 4 = 5 31. 15 ÷ 5 = 3 32. 16 ÷ 4 = 4
33. 2 ÷ 2 = 1 34. 5 ÷ 5 = 1

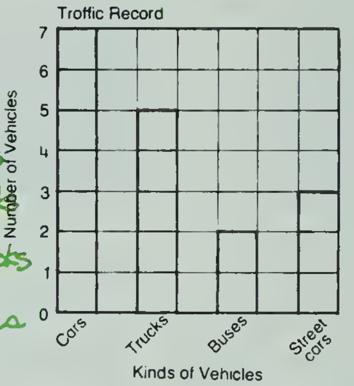
The children kept a record of traffic which passed the school in a 5 min period. They made a graph.

37. How many cars did they see? 7 cars

38. How many trucks did they see? 5 trucks

39. How many more trucks than buses passed the school? 3 more trucks

40. How many more cars than trucks passed the school? 2 more cars



Unit 1, Practice 3

Multiply.

1. $\begin{array}{r} 2 \\ \times 5 \\ \hline 10 \end{array}$ 2. $\begin{array}{r} 3 \\ \times 4 \\ \hline 12 \end{array}$ 3. $\begin{array}{r} 1 \\ \times 5 \\ \hline 5 \end{array}$ 4. $\begin{array}{r} 0 \\ \times 3 \\ \hline 0 \end{array}$ 5. $\begin{array}{r} 4 \\ \times 5 \\ \hline 20 \end{array}$ 6. $\begin{array}{r} 2 \\ \times 4 \\ \hline 8 \end{array}$ 7. $\begin{array}{r} 4 \\ \times 4 \\ \hline 16 \end{array}$ 8. $\begin{array}{r} 2 \\ \times 1 \\ \hline 2 \end{array}$

9. $\begin{array}{r} 3 \\ \times 2 \\ \hline 6 \end{array}$ 10. $\begin{array}{r} 3 \\ \times 1 \\ \hline 3 \end{array}$ 11. $\begin{array}{r} 3 \\ \times 0 \\ \hline 0 \end{array}$ 12. $\begin{array}{r} 5 \\ \times 5 \\ \hline 25 \end{array}$ 13. $\begin{array}{r} 3 \\ \times 3 \\ \hline 9 \end{array}$ 14. $\begin{array}{r} 1 \\ \times 1 \\ \hline 1 \end{array}$ 15. $\begin{array}{r} 0 \\ \times 4 \\ \hline 0 \end{array}$ 16. $\begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array}$

Divide.

17. 25 ÷ 5 = 5 18. 16 ÷ 4 = 4 19. 3 ÷ 3 = 1 20. 12 ÷ 4 = 3
21. 2 ÷ 2 = 1 22. 5 ÷ 5 = 1 23. 4 ÷ 4 = 1 24. 10 ÷ 2 = 5
25. 10 ÷ 5 = 2 26. 8 ÷ 2 = 4 27. 9 ÷ 3 = 3 28. 6 ÷ 2 = 3
29. 8 ÷ 4 = 2 30. 12 ÷ 3 = 4 31. 15 ÷ 5 = 3 32. 20 ÷ 4 = 5
33. 20 ÷ 5 = 4 34. 1 ÷ 1 = 1 35. 15 ÷ 3 = 5 36. 18 ÷ 3 = 6

The girls and boys in Room 29 made a graph of the birds the class saw on their walk.

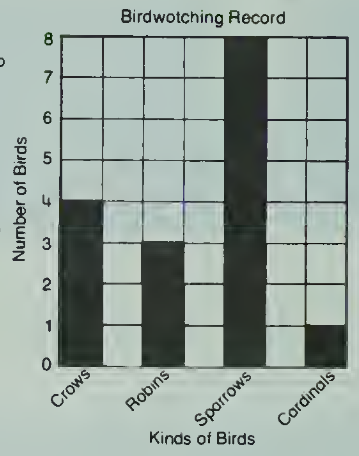
37. How many robins did they see? 3 robins

38. How many crows did they see? 4 crows

39. How many sparrows did they see? 8 sparrows

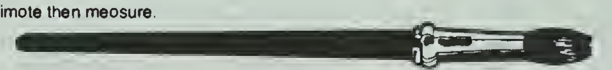
40. How many more sparrows than cardinals did they see? 7 more

41. How many birds did they see altogether? 16 birds

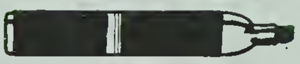


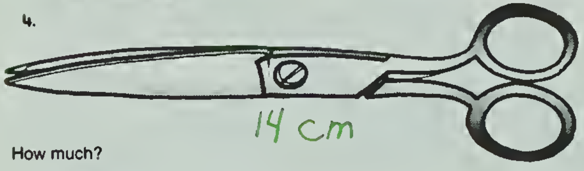
Unit 1, Check 4

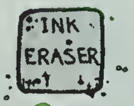
How many centimetres long is each?
Estimate then measure.

1.  14 cm

2. 3 cm

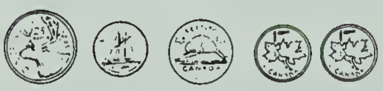
3.  7 cm

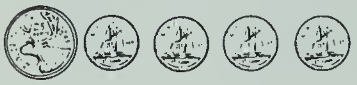
4.  14 cm

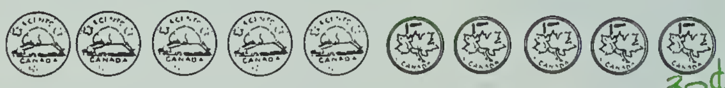
5. 

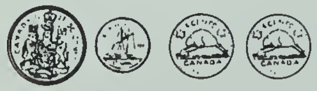
2 cm

How much?

8.  42¢

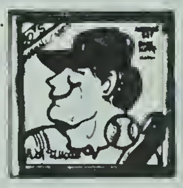
7.  65¢

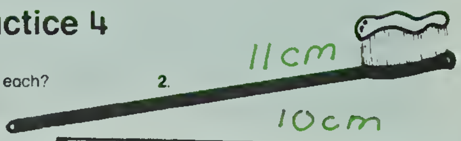
8.  30¢

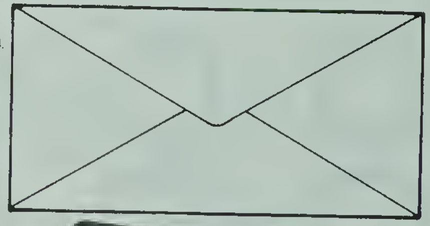
9.  70¢

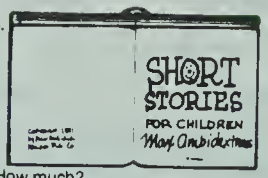
Unit 1, Practice 4

How many centimetres long is each?
Estimate, then measure.

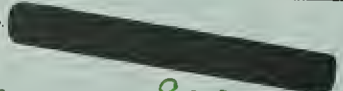
1.  4 cm

2.  11 cm

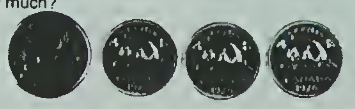
3.  10 cm

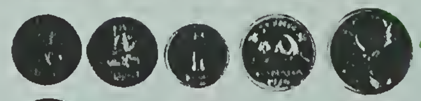
4. 

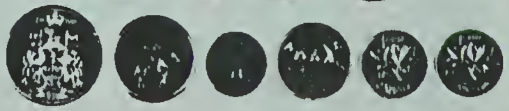
6 cm

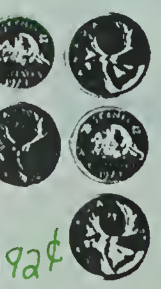
5.  8 cm.

How much?

6.  40¢

7.  42¢

8.  92¢

9.  85¢

Teaching Notes
Unit 2

Teaching Notes
Unit 3

Teaching Notes
Unit 4

Mathematics
Dictionary

Contents

See the *Unit at a Glance* for a detailed description of the objectives in each section.

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7	131–139	141–151
8	140–149	152–161
9	150–154	162–167
10	155–160	168–173
11	161–170	174–187
12	171–182	188–193

Unit 2 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 1					• apples, oranges, grapefruit • white paper plates • coloured paper plates • large cardboard "chocolate bar" • 1 L containers, labelled • containers with capacities greater than and less than 1 L • water, sand, cereal, rice • labels • large containers • coloured chalk • pail to hold more than 5 L • activity cards, TN page 97 • Program Masters 32, 33, 34, 35, 6	fraction one-half one-fourth one-tenth zero decimal one litre capacity
1	**90, 91**	**92, 93**	Exploring fractions: one-half, one-quarter, one-tenth	Plus Workbook pages 22 and 23		
2	**92, 93**	**94, 95**	Exploring fractions: relating the fraction $\frac{1}{10}$ to the decimal 0.1	Practice Masters pages 16 and 17		
3	**94**	**96**	Exploring capacity: the litre, greater than, less than 1 L			
4	**95**	**97**	Exploring capacity: greater than, less than 5 L	Plus Workbook page 25		
Section 2						
1	**96, 97**	**98, 99**	Exploring the properties of cones: making cones, comparing models with cone-shaped objects		• geometric solids: several commercial or paper models of cones, cylinders, cubes, rectangular prisms, circles, spheres • cone-shaped objects: ice cream cones, funnels, carrots • circles: cardboard regions • circular objects: lids, coins, cans, buttons, etc. • cylinder-shaped objects: cans, straws, wrapping paper rolls • old magazines or catalogues • rectangular-shaped objects: books, boxes • cubic, cylindrical and cone-shaped containers • small boxes • Plasticine, papier-mâché materials or modelling clay • centimetre rulers • real or play money • Program Masters 36, 37, 38	cone apex curved surface geometry cylinder circular base rectangle rectangular prism vertex edge face cube square solid sphere roll stack
2	**98**	**100**	Exploring the properties of cylinders: making cylinders, comparing models with cylinder-shaped objects			
3	**99**	**101**	Exploring the properties of rectangular prisms, making rectangular prisms, comparing models with real objects			
4	**100**	**102**	Exploring the properties of cubes: making cubes, comparing models with real objects			
5	**101**	**103, 104**	Exploring the properties of a sphere: comparing models with familiar spherical objects	Practice Masters page 18 Plus Workbook page 26		
6	**102, 103**	**105**	Recalling centimetres, money, fractions, decimals and geometric solids, solving word problems			
		106, 107	Art Ideas			

Unit 2 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 3					• blank cards for making flash cards • dice marked 5 to 10 and 8 to 12 • One Hundred Board • Program Master 22	
1	**104, 105**	**108, 109**	Recalling addition and subtraction facts using number pairs	Practice Masters page 19		
2	**106**	**110**	Byway: using number pairs to add and subtract			
3	**107**	**111**	Exploring extensions: number charts			
4	**108**	**112**	Exploring extensions: number charts	Plus Workbook page 27		
5	**109**	**113**	Extending basic facts to find sums and differences	Practice Masters page 20 Tests 1A, 1B Plus Workbook page 28		
Section 4						
1	**110, 111**	**114, 115**	Exploring place value and writing numerals: hundreds		• place-value mats • place-value materials • newspapers, catalogues or other printed material • counting instruction cards, TN page 118 • cubes • dice: one marked 0, 1, 2, 3, 4, 5; one marked 0, 2, 4, 6, 8, 9; one marked 4, 5, 6, 7, 8, 9 • deck of 32 cards: 10 marked 100; 10 marked 10; 10 marked 1; two marked STOP! • coloured cards: nine red; nine green; 10 yellow • overhead projector and transparency • stencils, TN pages 121, 123 • Program Masters 16, 17, 20, 21	hundreds 100-flat expanded numeral number meaning one thousand between symbol least greatest
2	**112**	**116**	Exploring place value and writing numerals: hundreds, tens, ones			
3	**113**	**117**	Exploring place value: expanded numerals	Practice Masters page 21 Plus Workbook page 29		
4	**114**	**118**	Ordering numbers: counting forward and backward			
5	**115**	**119**	Ordering numbers: numbers before, after and between			
6	**116**	**120, 121**	Exploring number patterns: counting by ones, twos, fours, fives	Practice Masters page 22		
7	**117**	**122, 123**	Exploring greater than, less than: comparing numbers			
8	**118**	**124, 125**	Ordering three-digit numbers: least to greatest, greatest to least	Practice Masters page 23 Plus Workbook pages 30 and 31		
9	**119**	**126**	Byway: *Sprouts*			

Unit 2 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 5					• place-value materials • place-value mats • base 10 materials including bean sticks • deck of *Concentration* cards, TN page 129 • dice marked 4, 5, 6, 7, 8, 9 • gameboard, TN page 132 • red, green, yellow and blue counters • Program Masters 19, 20, 16	exchange
1	**120**	**127**	Adding a two-digit and a one-digit number	Practice Masters page 24		
2	**121**	**128, 129**	Exchanging tens for ones			
3	**122, 123**	**130, 131**	Adding a two-digit and a one-digit number: exchanging ones for tens			
4	**124**	**132, 133**	Adding a two-digit and a one-digit number: expanded numerals	Practice Masters page 25 Plus Workbook pages 32 and 33		
Section 6						
1	**125**	**134, 135**	Subtracting a one-digit number from a two-digit number: no regrouping	Practice Masters page 26 Plus Workbook pages 34 and 35	• place-value mats • place-value materials • shoe box lids • modelling clay • marbles or pebbles • paints • subtraction cards, TN page 139 • Program Masters 19, 20	
2	**126**	**136**	Adding and subtracting	Plus Workbook page 36		
3	**127**	**137**	Making an exchange: regrouping tens and ones			
4	**128**	**138, 139**	Subtracting a one-digit number from a two-digit number: regrouping tens and ones			
5	**130**	**140**	Using expanded numerals to subtract one-digit numbers from two-digit numbers	Practice Masters page 27 Tests 2A, 2B Plus Workbook pages 37 and 38		

Unit 2 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 7					• place-value materials • place-value mats • deck of addition-question cards, TN page 144 • magazine cut-outs illustrating problems • large sheet of chart paper • Program Masters 19, 20, 22	
1	**131**	**141, 142**	Adding two-digit numbers: exchanging tens for ones			
2	**132**	**143**	Adding two-digit numbers: expanded numerals			
3	**133**	**144**	Adding two-digit numbers: regrouping, no regrouping	Practice Masters page 28 Plus Workbook pages 39 and 40		
4	**134**	**145, 146**	Subtracting a two-digit number from a two-digit number: regrouping			
5	**135**	**147**	Subtracting a two-digit number from a two-digit number: expanded numerals	Practice Masters page 29 Plus Workbook pages 41 and 42		
6	**136**	**148**	Byway: finding the missing numbers in addition and subtraction questions			
7	**137**	**149**	Recalling place value, number patterns, counting, comparing numbers, adding and subtracting			
8	**138, 139**	**150, 151**	Drawing pictures of problems	Plus Workbook page 43		
Section 8						
1	**140, 141**	**152, 153**	Exploring the properties of squares: drawing squares, comparing square regions to square-shaped objects		• movie *Dance Squared* (National Film Board) • cubes in a variety of sizes • collection of familiar square-shaped objects • geoboards • rulers • elastic bands • magazines or catalogues • movie *Notes on a Triangle* (National Film Board) • tracing paper • cardboard strips in various lengths with holes punched at 2 cm intervals	side geoboard triangle parallelogram hexagon regular hexagon circle/circular change
2	**142, 143**	**154, 155**	Exploring triangles: making triangles, comparing triangular regions to triangular objects			
3	**144, 145**	**156, 157**	Exploring rectangles: making rectangles, comparing rectangular regions to rectangular objects			
4	**146, 147**	**158, 159**	Exploring hexagons: making hexagons, comparing hexagonal figures to hexagonal objects			

Unit 2 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
5	**148**	**160**	Exploring circles: drawing circles, comparing circular regions with circular objects	Practice Masters page 30 Tests 3A, 3B Plus Workbook page 44	• paper fasteners • crayons • cardboard rectangular regions in a variety of sizes • rectangular prisms: geometric models, a variety of boxes • construction paper or several manilla tags • regular hexagonal prisms • regular hexaongal regions of cardboard in several sizes • cylinders • circular objects: lids, cans, jars, wrapping paper rolls, sections of pipe • lightweight cardboard • coins: quarters, dimes, nickels, pennies • Program Masters 2, 5, 7, 4, 8–13	
6	**149**	**161**	Solving word problems: adding and subtracting amounts of money	Practice Masters page 31 Plus Workbook page 45		
Section 9					• pocket mirrors • picture halves, cut along the line of symmetry and mounted on cardboard • magazines • lightweight cardboard • leaf collections • collection of pictures of symmetrical objects • construction paper: pieces 20 cm square in one colour; pieces 25 cm by 45 cm in another colour • rulers • tracing paper • cardboard figure • stencils, TN page 166 • Program Master 5	reflection reverse symmetry/ symmetrical line of symmetry identical asymmetrical slide design
1	**150, 151**	**162, 163**	Exploring symmetry			
2	**152**	**164, 165**	Exploring symmetry: making symmetrical figures			
3	**153**	**166**	Exploring symmetry: making symmetrical figures	Plus Workbook page 46		
4	**154**	**167**	Byway: sliding and tracing figures to create designs			

Unit 2 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 10						
1	**155-157**	**168-170**	Exploring perimeter: measuring with centimetres, problem solving	Plus Workbook page 47	• birthday card, length of sides given in centimetres • set of cards in assorted sizes, length of sides given in centimetres • assorted non-standard units: toothpicks, straws, paper clips, string, ribbon, erasers, etc. • chart paper • construction paper • collection of cardboard figures of various sizes: rectangles, parallelograms, hexagons, squares, the length of sides marked at 1 cm intervals • collection of cardboard figures with exact dimensions in centimetres, not marked • ball of string • centimetre rulers • collection of circular objects: records, plates, flat plastic lids, hoola hoops, embroidery frames, metal washers, etc. • tracing paper • stencils, TN pages 171, 173 • Program Masters 5, 2	perimeter
2	**158**	**171**	Exploring perimeter: counting centimetres, adding			
3	**159**	**172**	Exploring perimeter: measuring with centimetre rulers	Plus Workbook page 48		
4	**160**	**173**	Byway: finding the perimeter of a circle	Practice Masters page 32		
Section 11						
1	**161**	**174, 175**	Exploring decimals: 0.1 to 0.9		• lightweight cardboard • display-size number lines, TN page 178 • fractional pies to 9.9 • coloured fractional pies to 0.9 • cubes marked 0.1, 0.2, 0.3, 0.4, 0.8, 0.9 • white fractional pies • red fractional pies cut into tenths	zero decimal two zero decimal three zero decimal four • zero decimal nine
2	**162, 163**	**176, 177**	Exploring decimals: whole numbers and decimals to 9.9			
3	**164**	**178**	Exploring decimals: matching decimals to points on a number line			
4	**165**	**179, 180**	Greater than, less than: decimals less than 1.0	Plus Workbook page 49		

Unit 2 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
5	**166**	**181**	Exploring decimals: adding	Practice Masters page 33 Plus Workbook page 50	• die marked 0.1, 0.1, 0.2, 0.2, 0.3, 0.4 • die marked 0.4, 0.4, 0.5, 0.5, 0.6, 0.6 • set of cards, *mathways 3* page 167 • die marked 0.6, 0.6, 0.7, 0.8, 0.9, 0.9 • die marked 0.1, 0.2, 0.3, 0.4, 0.4, 0.5 • gameboard, marked dice, cardboard tenths, TN pages 186, 187 • decks of cards, TN page 187 • set of geometric models • stencil, TN page 180 • Program Masters 33, 6, 32, 19, 30	one decimal one one decimal two one decimal three • • • nine decimal nine kilometre
6	**167**	**182**	Byway: adding decimal tenths to make one	Plus Workbook page 51		
7	**168**	**183, 184**	Exploring decimals: subtracting	Practice Masters pages 34 and 35 Tests 4A, 4B Plus Workbook page 52		
8	**169**	**185**	Using decimals to solve word problems			
9	**170**	**186, 187**	Recalling decimals and geometric figures			
Section 12						
1	**171**	**188**	Exploring mass: estimating, measuring, comparing		• equal arm balances • bathroom scales • standard units of mass: 1 kg, ten 100 g, 20 g, ten 10 g, 5 g, ten 1 g, 500 g, 200 g, 50 g • Plasticine • collection of objects: fruit, rocks, crayons, etc. • 1 kg masses • empty containers with lids • sand or gravel • collection of objects, *mathways 3* page 172 • collection of objects: 1 g, 10 g, 100 g, *mathways 3* pages 173, 174 • plastic bags, ties and labels	equal arm balance mass
2	**172**	**189**	Exploring mass: estimating and measuring in kilograms			
3	**173, 174**	**190, 191**	Exploring mass: estimating and measuring 100 g, 10 g and 1 g			
	175–182	**192, 193**	Checks and Practices	Unit 2, Unit Test A, B		

Unit 2 Section 1 Lesson 1

Exploring Fractions: One-Half, One-Quarter, One-Tenth

Materials

- apples, oranges, grapefruit
- fractional pies, coloured to show fractions $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{10}$: Program Masters 32 and 33
- for each child
  - three circular or rectangular paper regions: Program Masters 34 and 35
  - crayons
- for each group
  - white paper plate
  - three parts of coloured paper plates: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$

Lesson

1

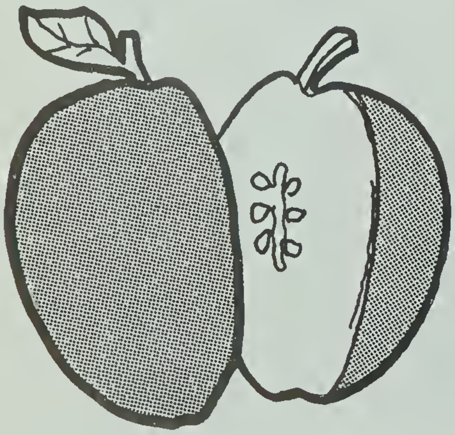
Gather the children around a table in the working area.

How many apples are here?

Cut the apple in half and ask

How many parts of the apple are there?

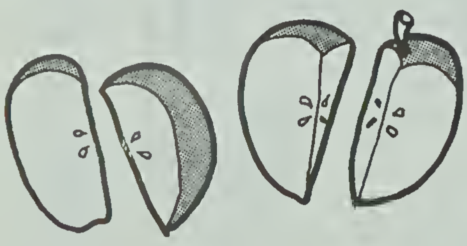
Are both parts equal?



Write the fraction $\frac{1}{2}$ on the easel. Explain that the *2* tells the number of equal parts and the *1* tells how many of those equal parts we are talking about.

2

Cut another apple into fourths and repeat the procedure outlined in step 1.



3

Cut an apple into tenths or use Program Master 33 and repeat the procedure.

4

Display the orange. Write on the easel

$\frac{1}{2}$ *one-half*

Ask

How many parts should I cut this orange into to show the fraction one-half?

Have a child show where to cut the orange to make the parts equal, emphasizing that if the parts are not equal they will not show one-half. Cut the orange and ask

What does the number below the line tell us?

What does the number above the line tell us?

Use another orange to show one-fourth and the grapefruit to show one-tenth.

5

Display the fractional pie, one-half coloured red. Ask

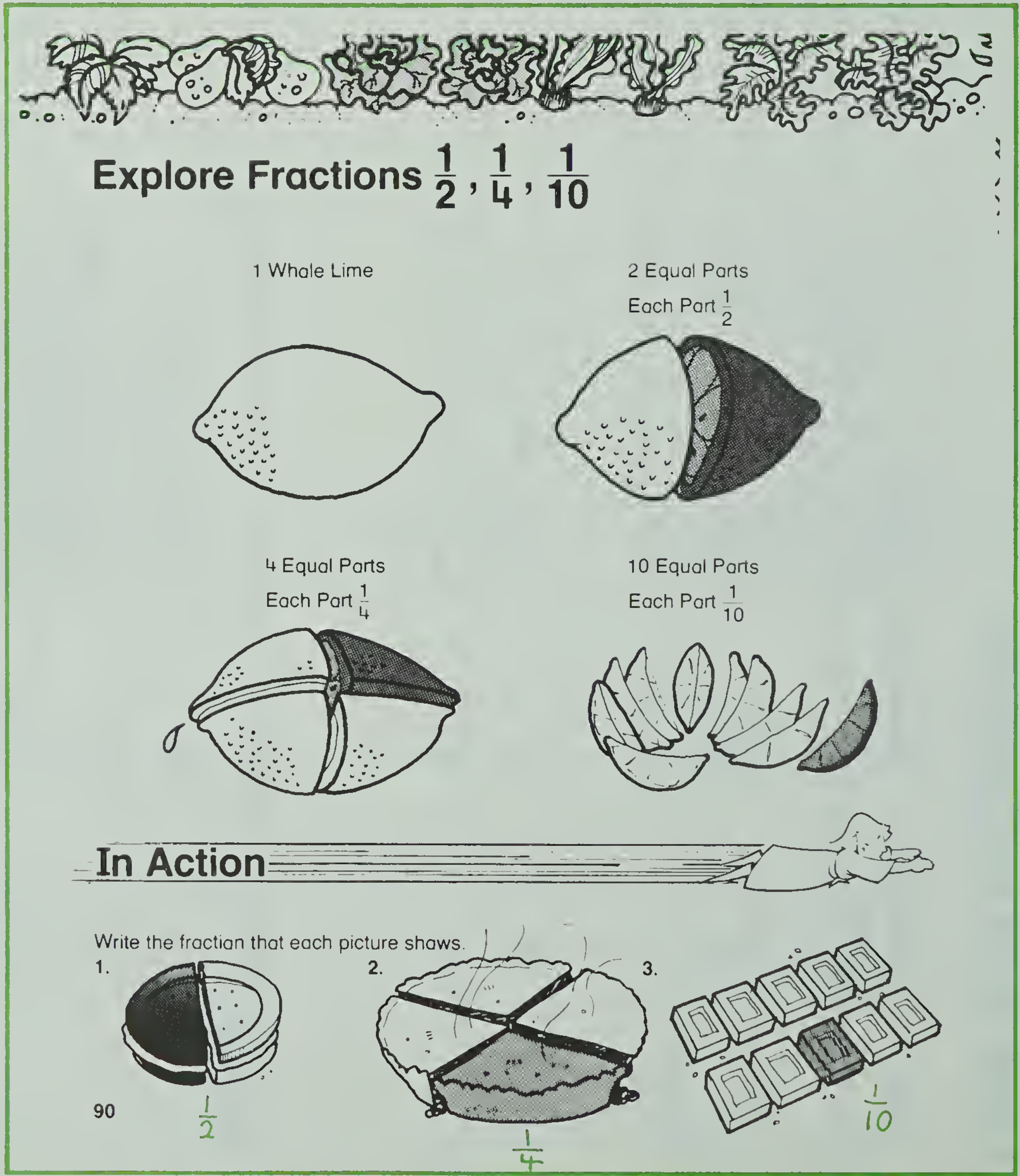
How many parts are there?

Are both parts equal?

Have a child write the fraction that represents one-half on the easel, telling the meaning of the numbers above and below the line. Repeat, displaying fractional pies for one-fourth and one-tenth.

6

Give each child three circular or rectangular regions made from Program Masters 34 and 35. Have the



Explore Fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$

1 Whole Lime

2 Equal Parts
Each Part $\frac{1}{2}$

4 Equal Parts
Each Part $\frac{1}{4}$

10 Equal Parts
Each Part $\frac{1}{10}$

In Action

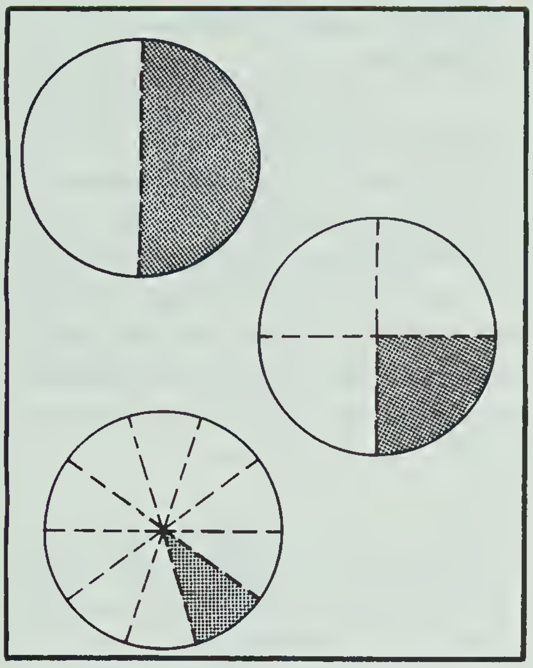
Write the fraction that each picture shows.

1. $\frac{1}{2}$

2. $\frac{1}{4}$

3. $\frac{1}{10}$

90

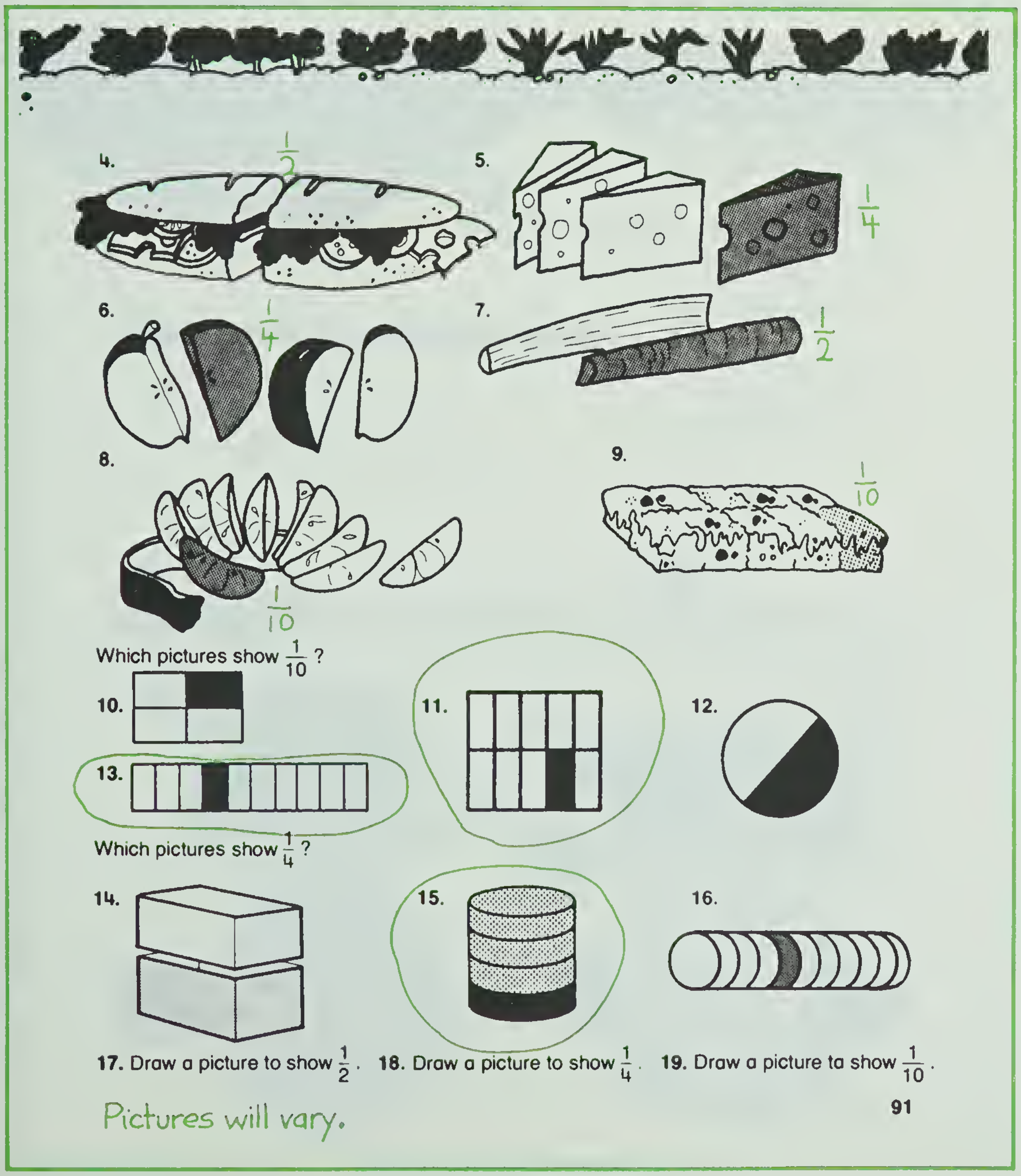


children fold and colour each to represent one of the fractions one-half, one-fourth and one-tenth, and glue them into their notebooks.

Written and Other Activities

☐

mathways 3, pages 90, 91
Have different children read the captions for the illustrations in the Explore section. Ask the children what the numbers above and below the line mean. Assign the In Action exercise. If desired, have the children draw the pictures called for in 17, 18 and 19 on separate sheets of paper, colour them and display them in the classroom.



4. $\frac{1}{2}$

5. $\frac{1}{4}$

6. $\frac{1}{4}$

7. $\frac{1}{2}$

8. $\frac{1}{10}$

9. $\frac{1}{10}$

Which pictures show $\frac{1}{10}$?

10.

11.

12.

13.

Which pictures show $\frac{1}{4}$?

14.

15.

16.

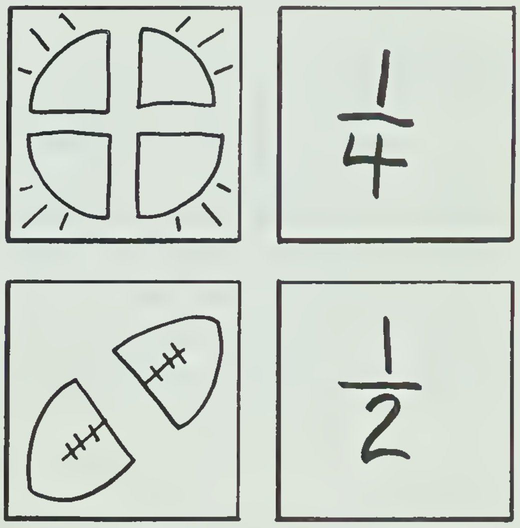
17. Draw a picture to show $\frac{1}{2}$. 18. Draw a picture to show $\frac{1}{4}$. 19. Draw a picture to show $\frac{1}{10}$.

Pictures will vary.

91

☐ ☐

Distribute blank cards or pieces of construction paper. Each child chooses a fraction to illustrate, and draws an appropriate picture on the front of the card and writes the fraction on the back.



Collect the cards. Then divide the children into groups and give each group a selection of the fraction pictures. A group leader holds up one picture at a time. The first group member to tell what fraction is written on the other side keeps the card. Children who make incorrect identifications must give up a card or miss a turn. The child who has the greatest number of cards when all have been identified is the winner.

☐ ☐ ☐

Place white and coloured paper plates in the centre of the working area. Have the children use the paper plates to construct models of each of the fractions one-half, one-fourth and one-tenth.

☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 22 and 23

Unit 2 Section 1 Lesson 2

Exploring Fractions: Relating the Fraction $\frac{1}{10}$ to the Decimal 0.1

Materials

- fractional pie, one-tenth coloured red: Program Master 33
- large cardboard "chocolate bar", 10 sections
- for each child
  - 2 cm graph paper: Program Master 6

Rationale

Since decimals rather than fractions denote units of measurement, decimal notation is introduced in the primary grades. It is important that the children recognize that the decimal 0.1 means one of ten equal parts of an object, and that $\frac{1}{10}$ and 0.1 are equivalent ways of representing the same number of parts.

Lesson

1

Gather the children around the easel. Display the fractional pie showing one-tenth coloured red. Ask a child to tell what fraction is represented and to write the fraction on the easel. Have another child explain the meaning of the numerator and denominator. Discuss the fraction, making sure that the children understand that it stands for only one of ten equal parts.

2

Write on the easel

$\frac{1}{10}$ 0.1

Explain that the decimal is another name for one-tenth, and that the zero to the left of the decimal point means zero whole objects, and the numeral 1 to the right means one-tenth of a whole object that has been separated into ten equal parts. Pointing to each element in the decimal, say

Zero decimal one means one-tenth.

Have a few children read the decimal aloud in the same way.

3

Display the "chocolate bar". Have a child count the squares. Cut off one square and put the rest of the bar aside. Holding up the square, ask a child to write on the easel two ways of representing the square. Have children read each expression.

One-tenth. Zero decimal one.

4

Distribute 2 cm graph paper. Instruct the children to cut out one 10-square section, colour one square, glue the sections into their notebooks and label them

$\frac{1}{10}$ 0.1

Discuss that it doesn't matter which of the 10 squares they choose to colour to show the fraction and the decimal number: whatever the position of the coloured square it will represent one of 10 equal parts or one-tenth or zero decimal one.

Written and Other Activities

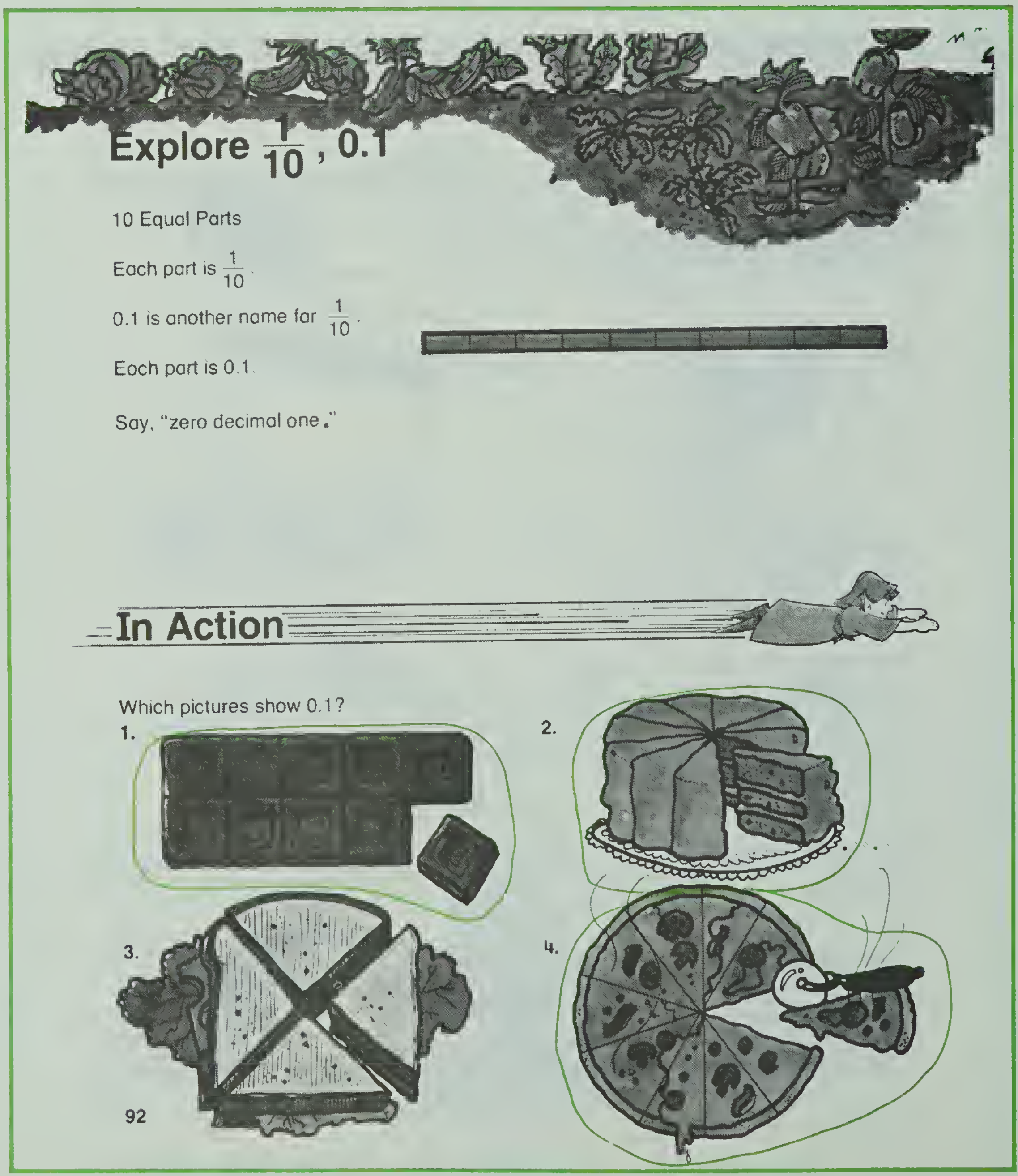
☐

mathways 3, pages 92, 93

Have a child read the Explore section aloud. Discuss the illustration, emphasizing that it shows one whole separated into 10 equal parts. Assign the In Action exercise. Instruct the children to use a separate sheet of paper to do question 12, so that the pictures can be displayed.

☐ ☐

Ask each of the children to trace one of the figures on page 93 and to colour a part different from the part coloured in the text. Have them label their diagrams two ways – 0.1 and $\frac{1}{10}$.



Explore $\frac{1}{10}$, 0.1

10 Equal Parts

Each part is $\frac{1}{10}$.

0.1 is another name for $\frac{1}{10}$.

Each part is 0.1.

Say, "zero decimal one."

In Action

Which pictures show 0.1?

1.

2.

3.

4.

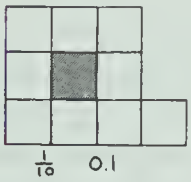
92

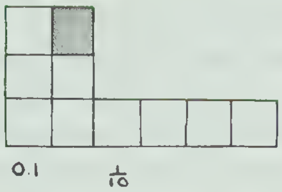
☐ ☐ ☐

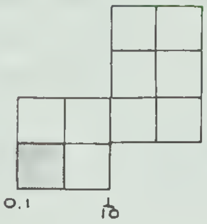
Ask the children to draw pictures to illustrate the fraction $\frac{1}{10}$.

☐ ☐ ☐ ☐

Have the children each cut several 10-unit regions from 2 cm graph paper. Each region should have a different shape. Ask the children to glue their regions into their workbooks, and colour and label $\frac{1}{10}$ of each region.







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mathways 3 Practice Masters pages 16 and 17

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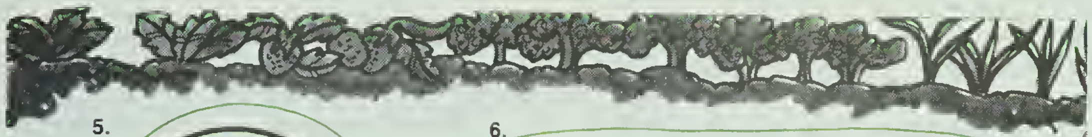
mathways 3 Plus Workbook page 24

For Your Notes



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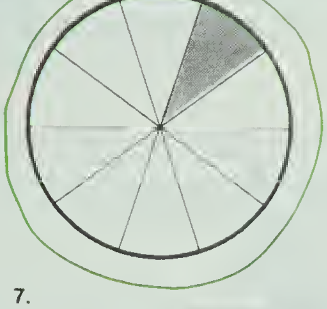

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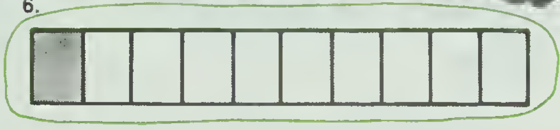

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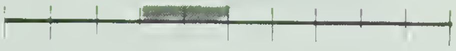

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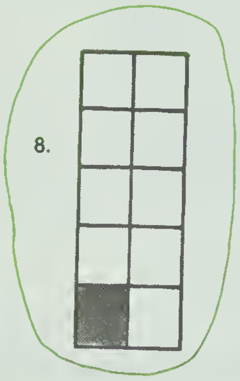

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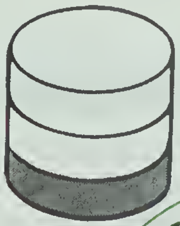

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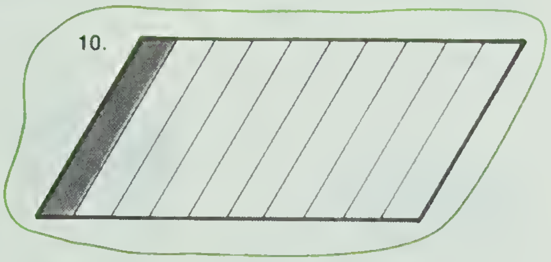

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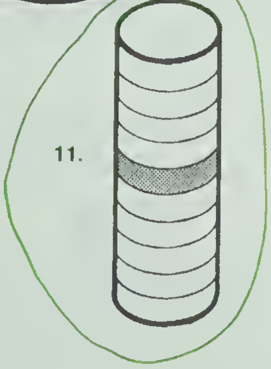


12. Draw a picture to show 0.1.

Pictures will vary.

Unit 2 Section 1 Lesson 3

Exploring Capacity: The Litre, Greater Than, Less Than 1 L

Materials

- for the measurement centre
  - 1 L containers, labelled
  - containers with capacities greater than and less than 1 L: cans, cartons, jars, bottles, vials, paper and plastic bags, plastic containers, pails
  - water, sand, cereal
  - labels
  - magic marker

Rationale

The basic unit for measuring capacity is the litre. All other units are related and designated by prefixes. The focus of Lessons 3 and 4 is on the litre only; the millilitre will be introduced later in the program.

When developing the concept of the litre, it is important that the children be given many opportunities to estimate, then measure the capacity of a variety of different containers. In this way, the children will begin to appreciate the relationship between size, shape and capacity. In addition, estimating, then measuring allows children to apply experience to the next estimate.

A measurement centre, equipped as described under Materials, in which small groups of children can explore will be of great benefit. Children who have had little or no experience in measuring capacity will profit from using non-standard units in addition to the litre.

Lesson

1

Gather the children around the measurement centre. Display and discuss a marked 1 L container. Then, making reference to the other containers on display, ask

Which of these containers do you think will hold about one litre?

Help the children to check their estimates, measuring the capacity of each container named by filling it with sand, cereal or water and pouring the contents into the 1 L container. As each container's capacity is measured, discuss whether it is greater than or less than 1 L. Write on the easel

one litre 1 L

Explain that the capital letter L is the symbol for litre.

2

Rearrange the containers on the display table. Then ask the children to pick out containers with capacities of less than 1 L. Have a child check each estimate by filling the labelled 1 L container and pouring the contents into the chosen container, then filling the selected container and pouring the contents into another marked 1 L container. Repeat the activity, asking children to select containers with a capacity greater than 1 L. Write on the easel

Capacity

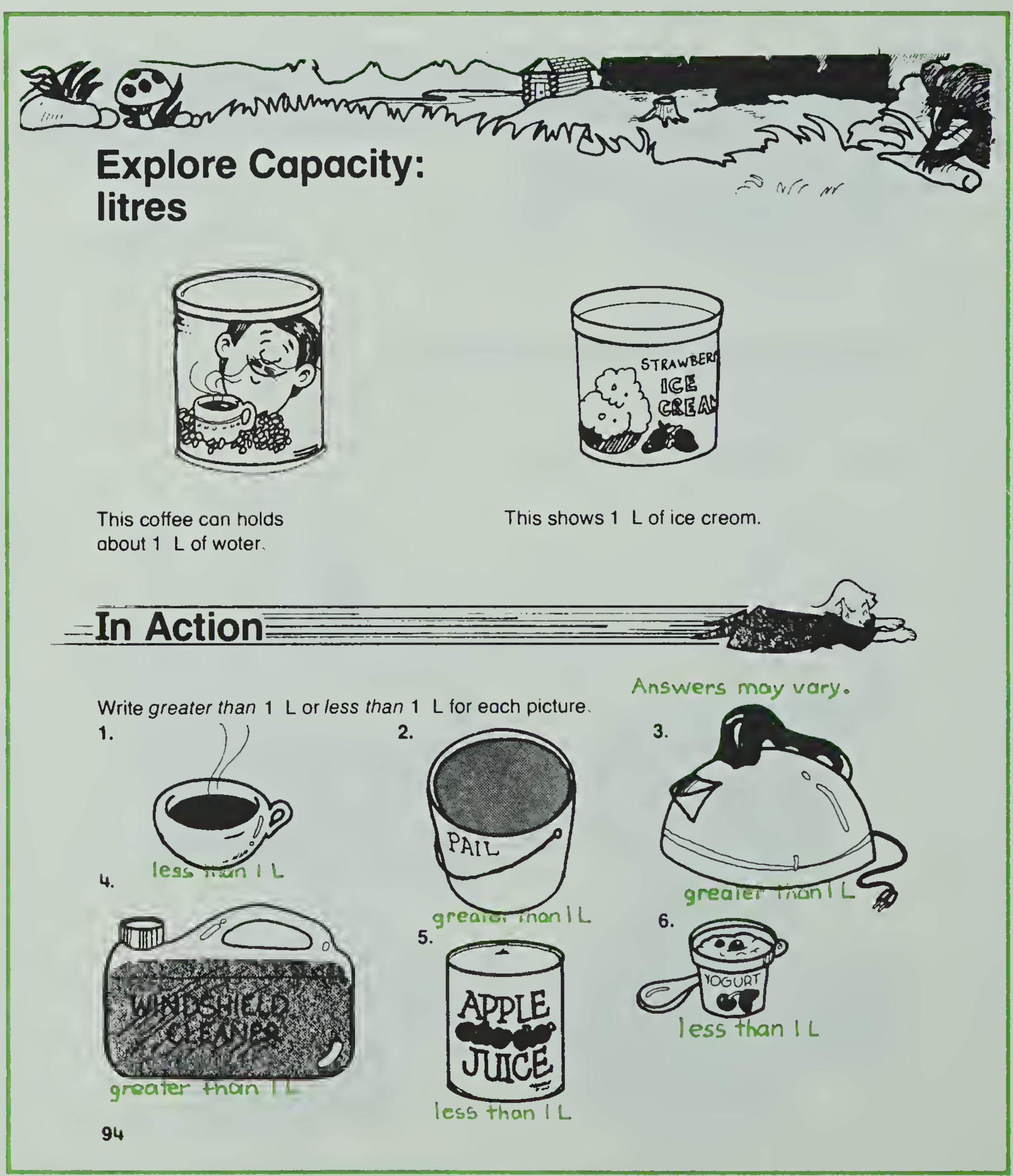
Have children tell the meaning in their own words.

Written and Other Activities

☐

mathways 3, page 94

Compare the coffee can and ice cream container in the illustration with containers in the measurement centre. Discuss the apparent differences in size. Assign the In Action exercise.



Explore Capacity: litres

This coffee can holds about 1 L of water.

This shows 1 L of ice cream.

In Action

Answers may vary.

Write *greater than* 1 L or *less than* 1 L for each picture.

1. less than 1 L
2. greater than 1 L
3. greater than 1 L
4. greater than 1 L
5. less than 1 L
6. less than 1 L

94

Unit 2 Section 1 Lesson 4

Exploring Capacity: Greater Than, Less Than 5 L

Materials

- large containers, between 3 L and 8 L, unmarked
- marked 1 L containers in a variety of materials and shapes
- coloured chalk
- pail to hold more than 5 L
- water, sand, rice or cereal
- activity cards, *see* ☐ ☐ ☐

Lesson

1

Gather the children around the measurement centre. Display the 1 L marked container and a large pail. Ask each child to estimate and mark the pail with coloured chalk to show where 5 L of water would come. Using the 1 L container and water, check each estimate.

2

Have children select a container that has a capacity of less than 5 L. Have them use the 1 L container and an appropriate substance to check their estimates.

3

Have the children select containers with a capacity greater than 5 L and measure to verify their estimates.

4

Select a container and have each child record an estimate of its capacity. Use the 1 L measure and an appropriate substance to check each estimate.

5

Have each child list two containers that have a capacity greater than 1 L and two with a capacity of less than 1 L. Have the children measure to check their estimates and report to the class.

Written and Other Activities

☐

mathways 3, page 95

Have a child read the instructions for the first In Action exercise, and another child read the instructions for number 7. Have the children explain what they will do in their own words. Encourage the children to use the equipment in the measurement centre. Have them display their results on charts to display in the centre or around the classroom.

☐ ☐

Have the children bring in containers whose capacities are marked in litres. Have them measure the capacity of each container in a non-standard unit, such as a pinch, a drop, a capful, a handful, a spoonful and so on. Discuss with the children the relative merits of the standard and non-standard unit. For example, how useful is it for a shopper to know that a large bag of dog food contains a thousand pinches or 60 handfuls? What if the people at the factories have small and large hands?

☐ ☐ ☐

Prepare activity cards with instructions such as the following:

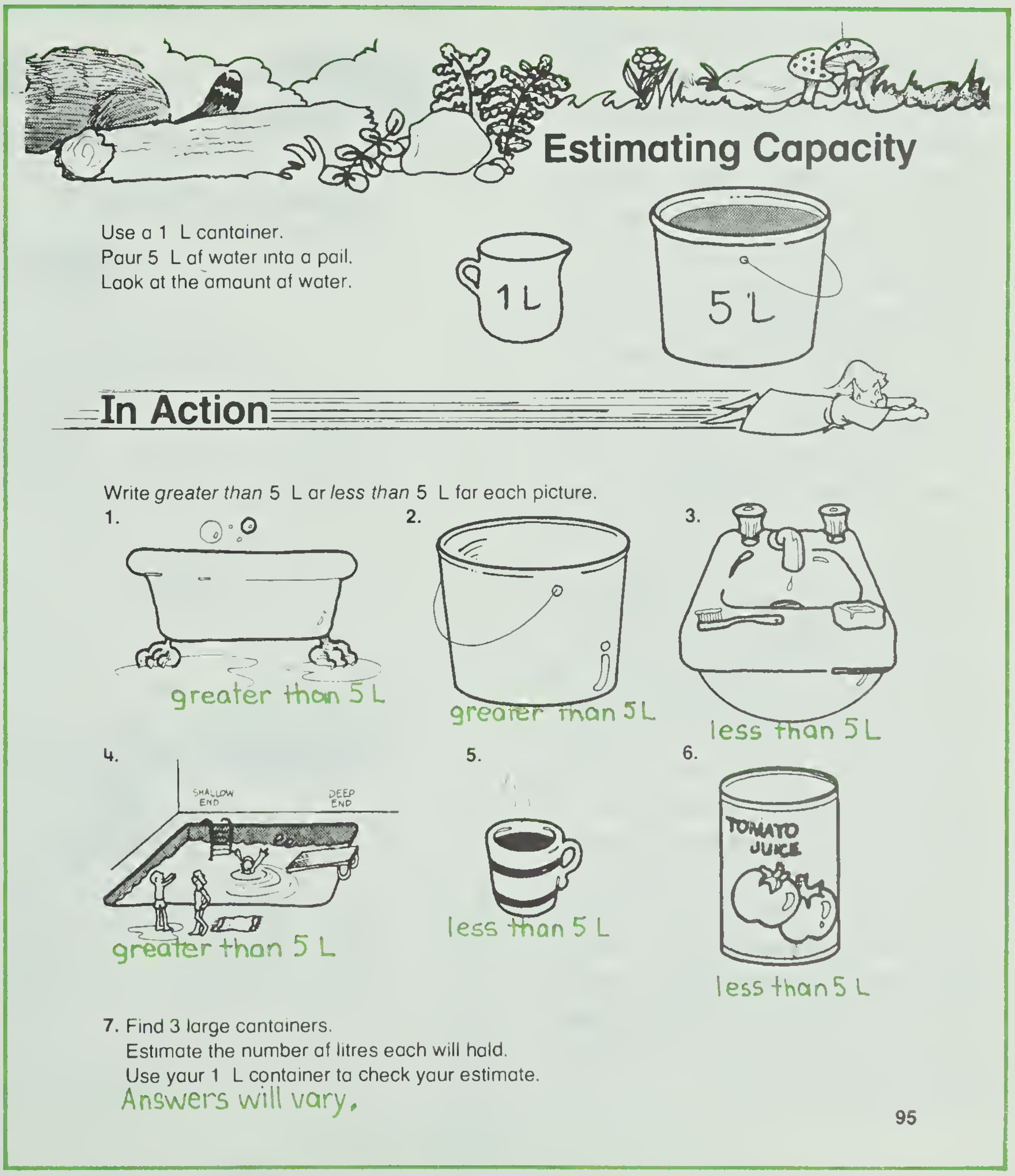
Estimate and measure the capacity of five containers and complete this chart:

Container	Unit	Estimate	Measurement

Invite the children to think of other activities and make up similar cards for the activity centre.

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 25



Estimating Capacity

Use a 1 L container.
Pour 5 L of water into a pail.
Look at the amount of water.

In Action

Write *greater than* 5 L or *less than* 5 L for each picture.

1. greater than 5 L

2. greater than 5 L

3. less than 5 L

4. greater than 5 L

5. less than 5 L

6. less than 5 L

7. Find 3 large containers.
Estimate the number of litres each will hold.
Use your 1 L container to check your estimate.
Answers will vary.

95

Unit 2 Section 2 Lesson 1

Exploring the Properties of Cones: Making Cones, Comparing Models with Cone-Shaped Objects

Materials

- cones, commercial or paper models
- cone-shaped objects: ice cream cones, funnels, carrots
- circles: cardboard regions
- circular objects: lids, coins, cans, buttons, etc.
- for each child
  - pair of scissors
  - tape
  - paper
  - net of a cone, reproduced from Program Master 36

Rationale

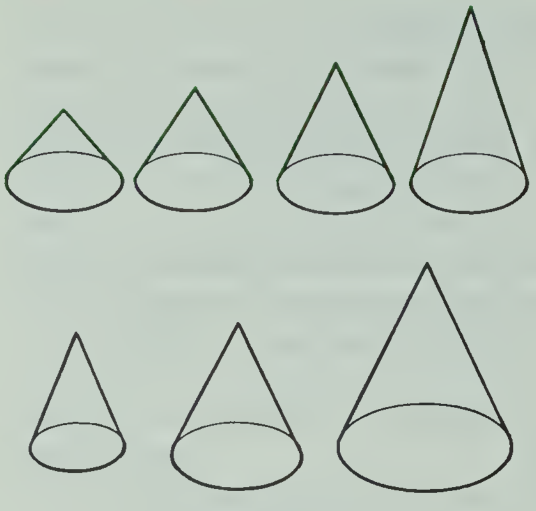
The emphasis in this section is on developing awareness of three-dimensional real-world objects through exploring the properties of geometric models. Lessons on geometric solids begin with patterns for the children to trace, cut out and fold to create three-dimensional models. When these are complete, properties – vertices, faces, curved surfaces – are considered. Then the children trace faces to make two-dimensional figures, thus discovering the relation between plane figures and solids. Finally, these models are compared with familiar objects in the environment that have the same shape. The children should be given many opportunities to create models, trace faces and, most of all, to experiment. For example, will a solid on a flat surface roll no matter how it is placed, or only when placed in particular ways? Can identical solids be stacked? In what ways are geometric models and real objects that resemble them the same or different? If a geometry centre is set up with several commercial solids and appropriate materials for tracing and cutting, the children will have a chance to construct more of the models made during lessons and to display them next to familiar objects brought from home. A number of such items are suggested under Materials throughout Section 2.

Lesson

1

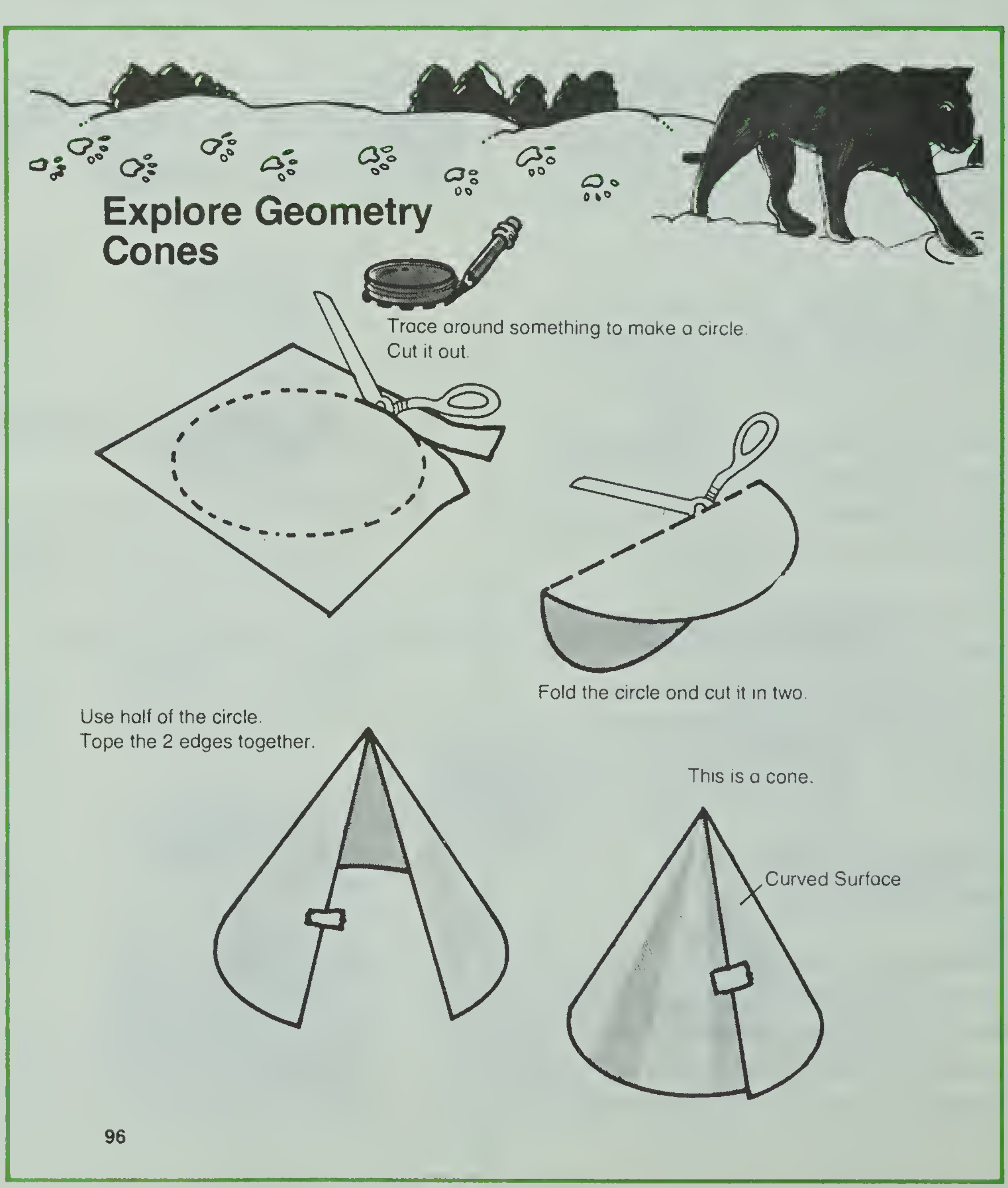
Seat the children around the working area. Give each child a model of a cone and allow time for full examination. Ask the children to describe their cones. The resulting descriptions can indicate what the children have learned about solids, helping determine how much repetition is necessary in the lesson. Tell the children that the models are called cones.

If the models differ in size, have the children order them according to height or base circumference. Discuss ways in which the cones are similar and different.



2

Have the children make a display of objects suggesting cones in the centre of the working area. Ask each child how each object is like a cone and how it differs.



Explore Geometry Cones

Trace around something to make a circle. Cut it out.

Fold the circle and cut it in two.

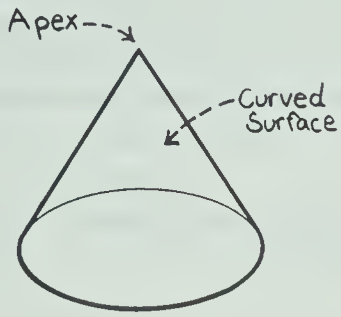
Use half of the circle. Tape the 2 edges together.

This is a cone.

96

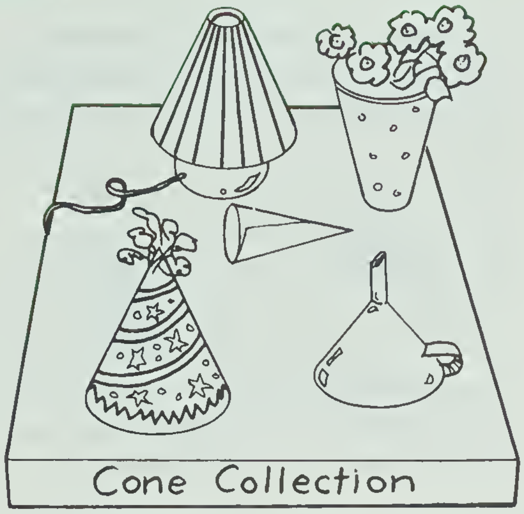
3

Point out the apex and the curved surface of the cone, and ask children to suggest possible reasons for using these names.

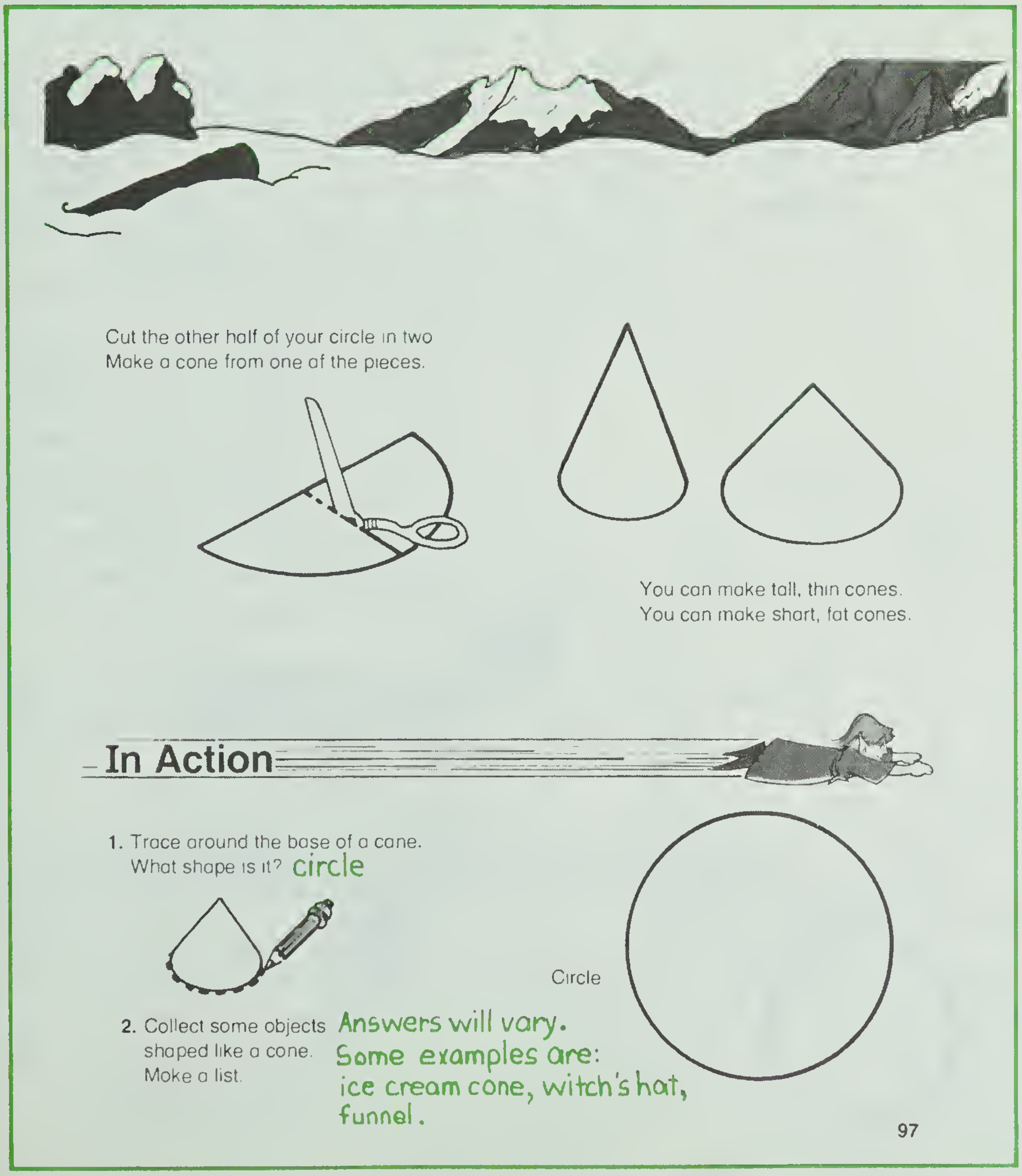


4

Declare Monday as *cone day*. Invite all of the children to bring something from home that is shaped like a cone. Make a display of the contributions.



As each item is brought to class, add it to the display. When a number of items have been collected, gather the children around the display area to discuss the conical objects, their function in our lives and so on.



Cut the other half of your circle in two
Make a cone from one of the pieces.

You can make tall, thin cones.
You can make short, fat cones.

In Action

1. Trace around the base of a cone.
   What shape is it? circle

2. Collect some objects shaped like a cone. Make a list. Answers will vary. Some examples are: ice cream cone, witch's hat, funnel.

97

Written and Other Activities

☐

mathways 3, pages 96, 97

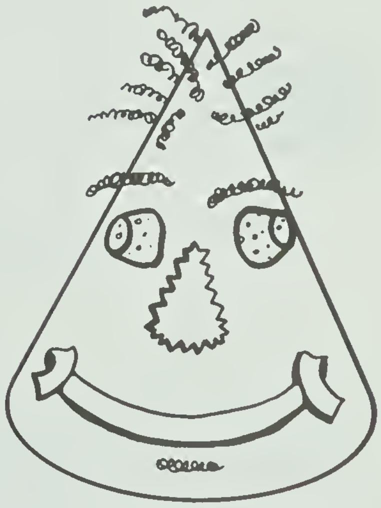
Discuss the examples of cones shown on pages 96 and 97. Introduce the word *geometry*, and have a child read the words *curved surface*. Then have each child follow directions given on the page to make a cone for the display table. Have the children compare the sizes of the models they make. For exercise 2, encourage the children to list all cone-shaped objects they can think of in addition to those that have been collected.

☐ ☐

Have the children draw some of the cone-shaped objects on the display table.

☐ ☐ ☐

Art ideas related to geometry are given on pages 106 and 107 of this manual. Select one that relates to cones for an art lesson.



Unit 2 Section 2 Lesson 2

Exploring the Properties of Cylinders: Making Cylinders, Comparing Models with Cylinder-Shaped Objects

Materials

- geometric solids: several commercial or paper models of cones, cylinders, cubes, rectangular prisms, circles
- cylinder-shaped objects: cans, straws, wrapping paper rolls
- for each child
  - pair of scissors
  - paper
  - tape
  - old magazines

Lesson

1

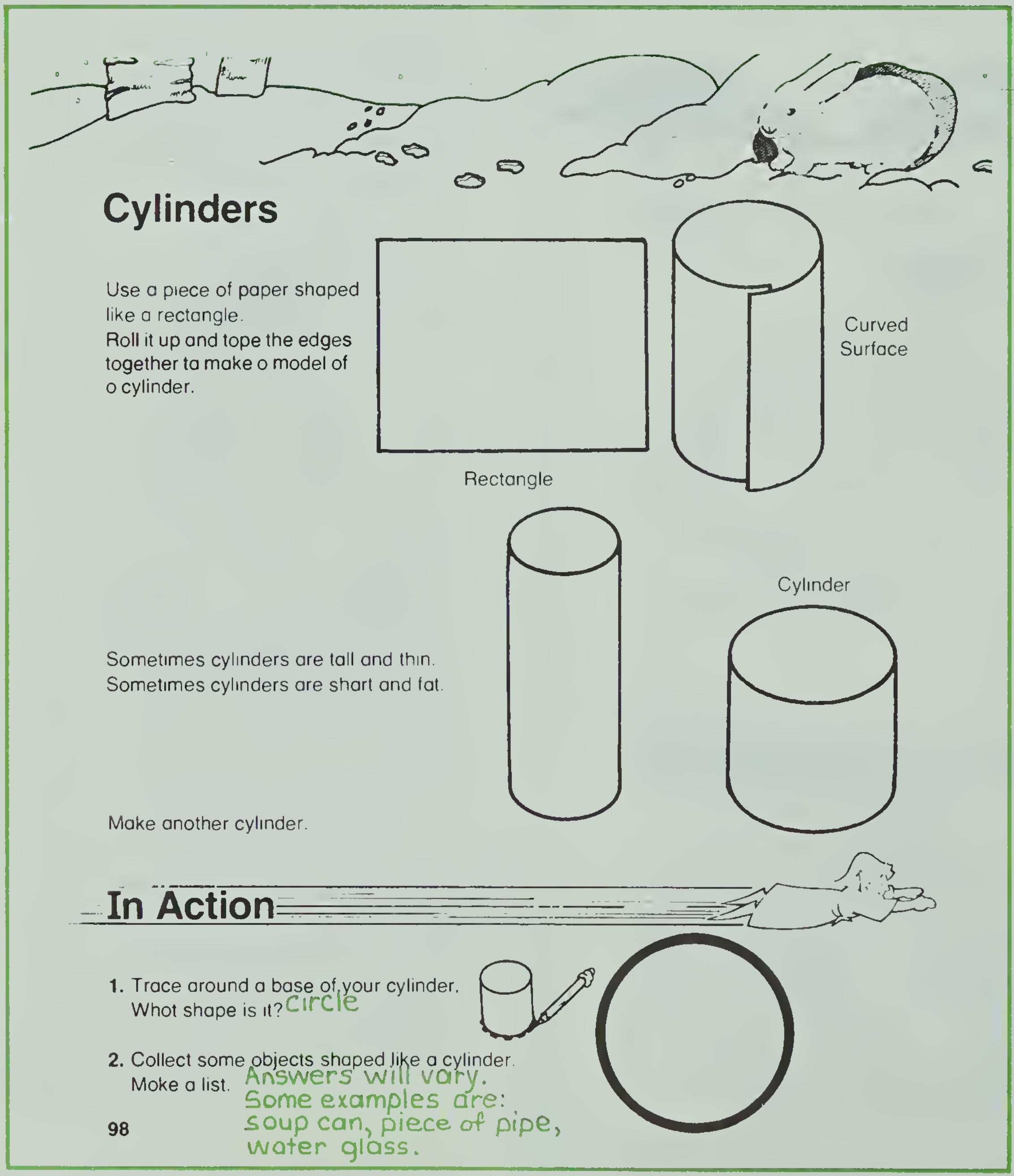
Invite the children to join you in the working area. Give each child a model of a cylinder. Tell them its name and ask children what they notice about the model. If they do not mention the curved surface and circular base, point these features out.

2

Display cylinder-shaped objects alongside objects shaped like other geometric solids, such as cones, cubes, rectangular prisms. Have the children select the cylinder-shaped objects from this collection and give the reasons for their choices. Point to other objects and ask why they were not chosen.

3

Place a model of a cylinder on a display table. Discuss the ways in which nature makes use of the cylinder. Things that might be considered include plant stems, animals' legs, tree trunks and so on. Discuss the fact that nature employs cylinders to do heavy work and that humans have learned from this observation. Encourage the children to bring in cylinder-shaped objects for the display table. In this manner, consider a new solid each week, until all five geometric solids have been explored and discussed.



Cylinders

Use a piece of paper shaped like a rectangle.
Roll it up and tape the edges together to make a model of a cylinder.

Sometimes cylinders are tall and thin.
Sometimes cylinders are short and fat.

Make another cylinder.

In Action

1. Trace around a base of your cylinder. What shape is it? circle
2. Collect some objects shaped like a cylinder. Make a list. Answers will vary. Some examples are: soup can, piece of pipe, water glass.

98

Written and Other Activities

☐

mathways 3, page 98

Discuss the pictures of cylinders on page 98, and have children read the words *rectangle* and *curved surface.* Discuss the method of making cylinders described in the text. Then provide materials for making cylinders. Give each child a rectangular sheet of paper. Vary the size of sheets. Discuss and order the resulting cylinders.

When exercise 1 has been completed, have the children trace the base of several cylinders to show that, regardless of size, all cylinder bases have the same shape.

Select a cardboard model of a cylinder. Have children predict the shape of the cardboard region should you cut the cylinder along a height line and open it out. Cut and open out the cylinder to verify predictions. Then have each child choose a model to cut along a chosen height line and open out.

☐ ☐

Use some of the art suggestions relating to cylinders on TN pages 106 and 107 of this manual.

☐ ☐ ☐

Give each of the children old magazines and scissors. Have them find and cut pictures of cylinders in the real world.

Unit 2 Section 2 Lesson 3

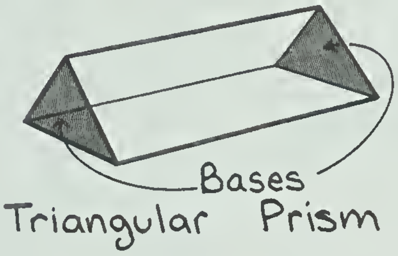
Exploring the Properties of Rectangular Prisms: Making Rectangular Prisms, Comparing Models with Real Objects

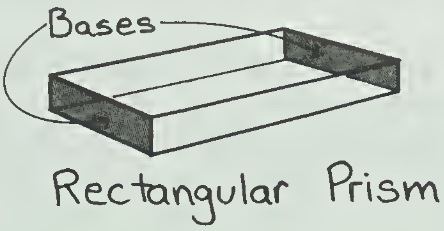
Materials

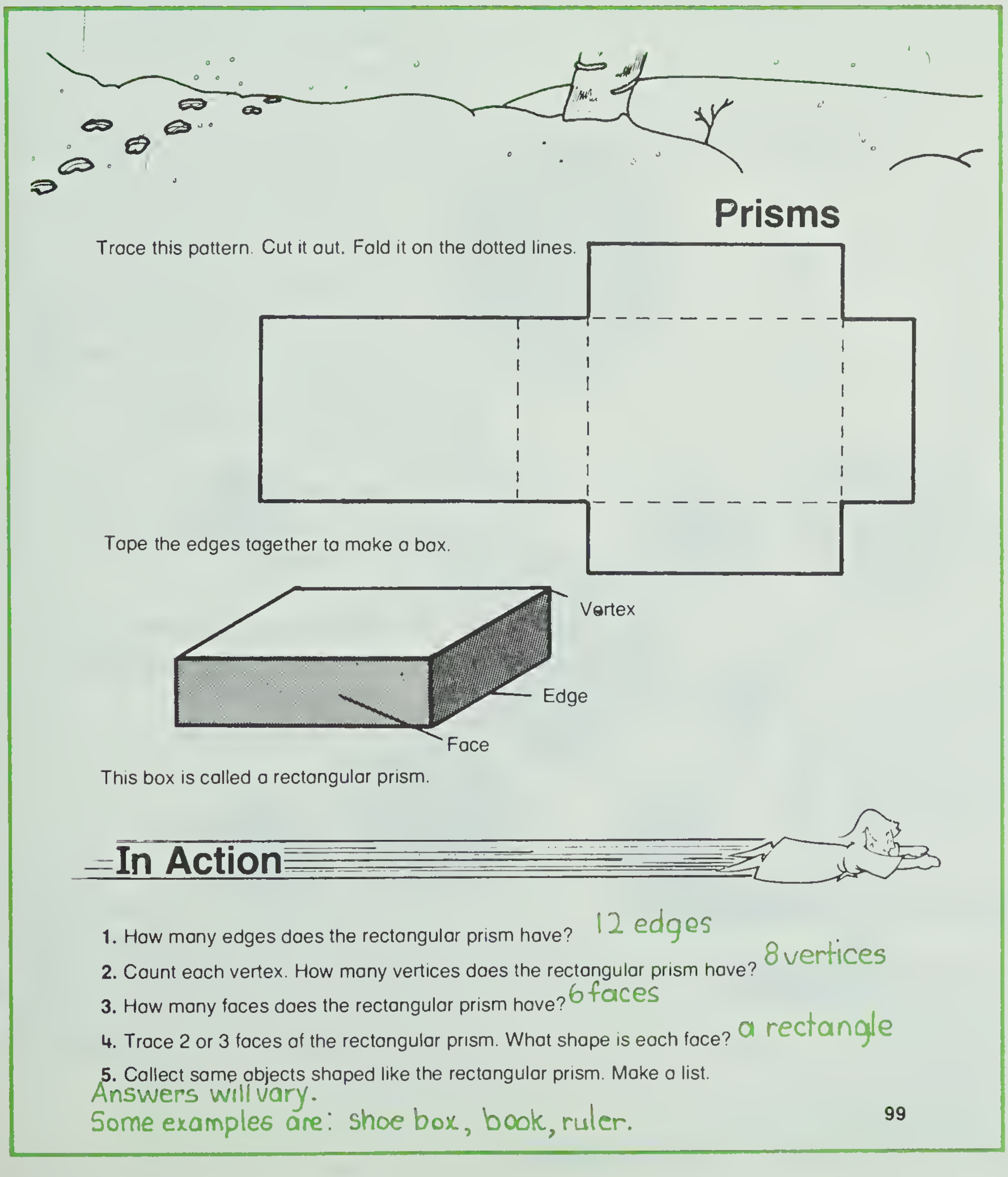
- rectangular prisms, several commercial or paper models
- rectangular-shaped objects: books, boxes
- for each child
  - net of a rectangular prism, reproduced from Program Master 37
  - pair of scissors
  - paper
  - tape

Rationale

A prism is a three-dimensional model whose bases are congruent polygons and whose other faces are parallelograms. Thus, the bases of a triangular prism are triangles and the bases of a rectangular prism are rectangles. Through experiment and discussion, the children will begin to develop awareness of these properties.







Prisms

Trace this pattern. Cut it out. Fold it on the dotted lines.

Tape the edges together to make a box.

Vertex
Edge
Face

This box is called a rectangular prism.

In Action

1. How many edges does the rectangular prism have? 12 edges
2. Count each vertex. How many vertices does the rectangular prism have? 8 vertices
3. How many faces does the rectangular prism have? 6 faces
4. Trace 2 or 3 faces of the rectangular prism. What shape is each face? a rectangle
5. Collect some objects shaped like the rectangular prism. Make a list.
Answers will vary.
Some examples are: shoe box, book, ruler.

99

Lesson

1

Seat the children around the working area and give each child a rectangular prism. Tell the children its name. Pointing to a vertex, tell them that the corner is called a *vertex*. Ask children to point to the vertices on their rectangular prisms. Point out the faces and edges of the model and repeat the procedure.

2

Display a few objects resembling the model of a rectangular prism and discuss with the children how the model and the objects are alike.

3

Have the children practise using the terms *face, edge, vertex* by playing a game in which one child points to, for example, an edge, and another child names it. The child who gives the name then points to a vertex or a face, and the game continues. When all the children have responded, reverse the procedure, asking a child to name a part for another child to point out.

4

Have the children cut from catalogues or magazines pictures showing how rectangular prisms are used.

Written and Other Activities

☐

mathways 3, page 99

Provide the necessary equipment and help the children to follow the directions for making prisms. In doing exercises 1 to 3, the children may find it easier to count the vertices, faces and edges on the models they have made.

☐ ☐

Have the children experiment with ways of stacking rectangular prisms.

☐ ☐ ☐

Have the children make rectangular prisms, using straws and Plasticine, for the display table.

☐ ☐ ☐ ☐

Use one of the suggestions given on TN pages 106 and 107 of this manual for an art lesson.

Unit 2 Section 2 Lesson 4

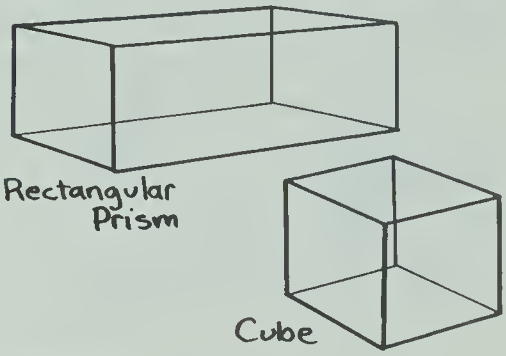
Exploring the Properties of Cubes: Making Cubes, Comparing Models with Real Objects

Materials

- rectangular prisms
- cubes, several commercial or paper models
- cubic, cylindrical and cone-shaped containers
- magazines or catalogues
- magic marker
- for each child
  - net of a cube: Program Master 38
  - pair of scissors
  - tape or glue
  - paper
  - small box

Rationale

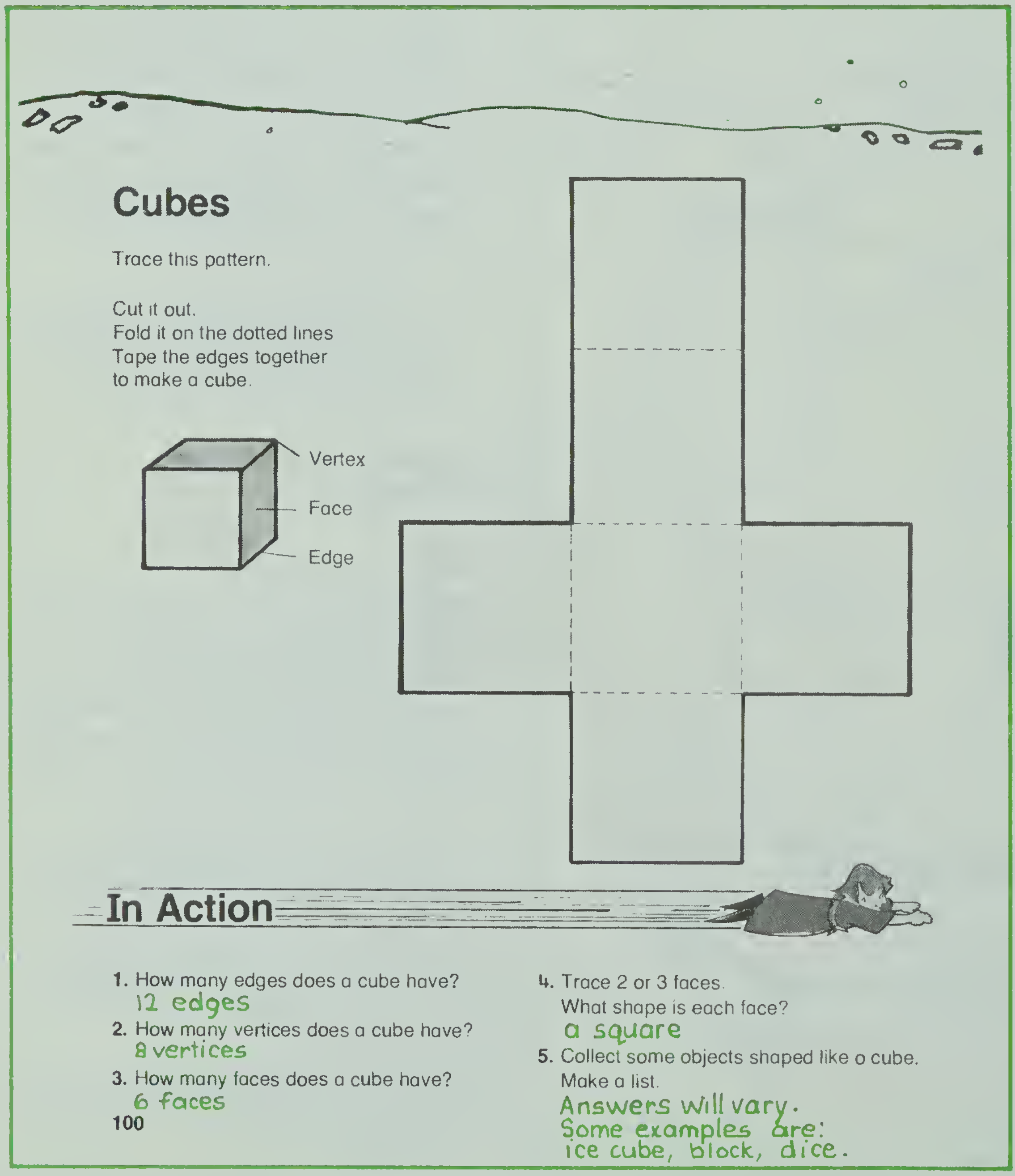
Through experiment and discussion the children will develop awareness that a square is a rectangle having four sides equal in length and that a cube is a rectangular prism whose six sides are congruent squares.



Lesson

1

Invite the children into the working area and give each a rectangular prism, reminding them of the model's name. Have children count, point to and name the vertices, faces and edges.



Cubes

Trace this pattern.

Cut it out.
Fold it on the dotted lines
Tape the edges together
to make a cube.

Vertex
Face
Edge

In Action

1. How many edges does a cube have?
   12 edges
2. How many vertices does a cube have?
   8 vertices
3. How many faces does a cube have?
   6 faces
4. Trace 2 or 3 faces.
   What shape is each face?
   a square
5. Collect some objects shaped like a cube.
   Make a list.
   Answers will vary.
   Some examples are:
   ice cube, block, dice.

100

2

Give each child in the group a model of a cube. Have the children point out, name and count the vertices, faces and edges. Tell the children that this is a special kind of rectangular prism called a *cube*. Ask them if they can notice anything special about their cubes. Manage the discussion to show that the six faces are identical and that each face is a square.

3

Provide the children with the appropriate materials and have them cut out and mount pictures that show how the various geometric solids are used. Outline the solid in each picture with magic marker. If desired, have the children mount the pictures on paper or lightweight cardboard to give them substance. A very effective bulletin board display can be made in this way.

4

Give each child a small box. The children will enjoy bringing these from home. Display one box and tell the children that you are going to cut along each of its four edges and flatten it out. Have each child predict the resulting shape of the box by sketching it. Cut and flatten the box to verify predictions.

Then allow the children to cut and flatten their boxes to examine the results for themselves.

5

Have children open containers that suggest cubes, cylinders and cones.

Written and Other Activities

☐

mathways 3, page 100

Have children read the terms *vertex, face* and *edge*. Provide the appropriate materials and help the children follow the directions given for making cubes. Discuss the role of cubes in the world, for example, as shipping containers and so on.

Unit 2 Section 2 Lesson 5

Exploring the Properties of a Sphere: Comparing Models with Familiar Spherical Objects

Materials

- geometric models: several spheres, cone, cylinder, rectangular prism, cube
- Plasticine, papier-mâché materials or modelling clay
- magazines or catalogues
- for each child
  - pair of scissors
  - glue or tape
  - paper

Lesson

1

Gathering the children round, display a cone, cylinder, rectangular prism, cube and sphere in the centre of the working area. Introduce the term *sphere*. Encourage the children to compare the sphere with each of the other solids and tell the ways in which they are alike and different. For example, children may mention that cones, cylinders and spheres roll, but only spheres roll no matter what position they are placed in. Cones have a flat surface and spheres do not. Rectangular prisms have edges and vertices, but spheres have curved surfaces. Cubes can be stacked without leaving any spaces, but spheres cannot.

2

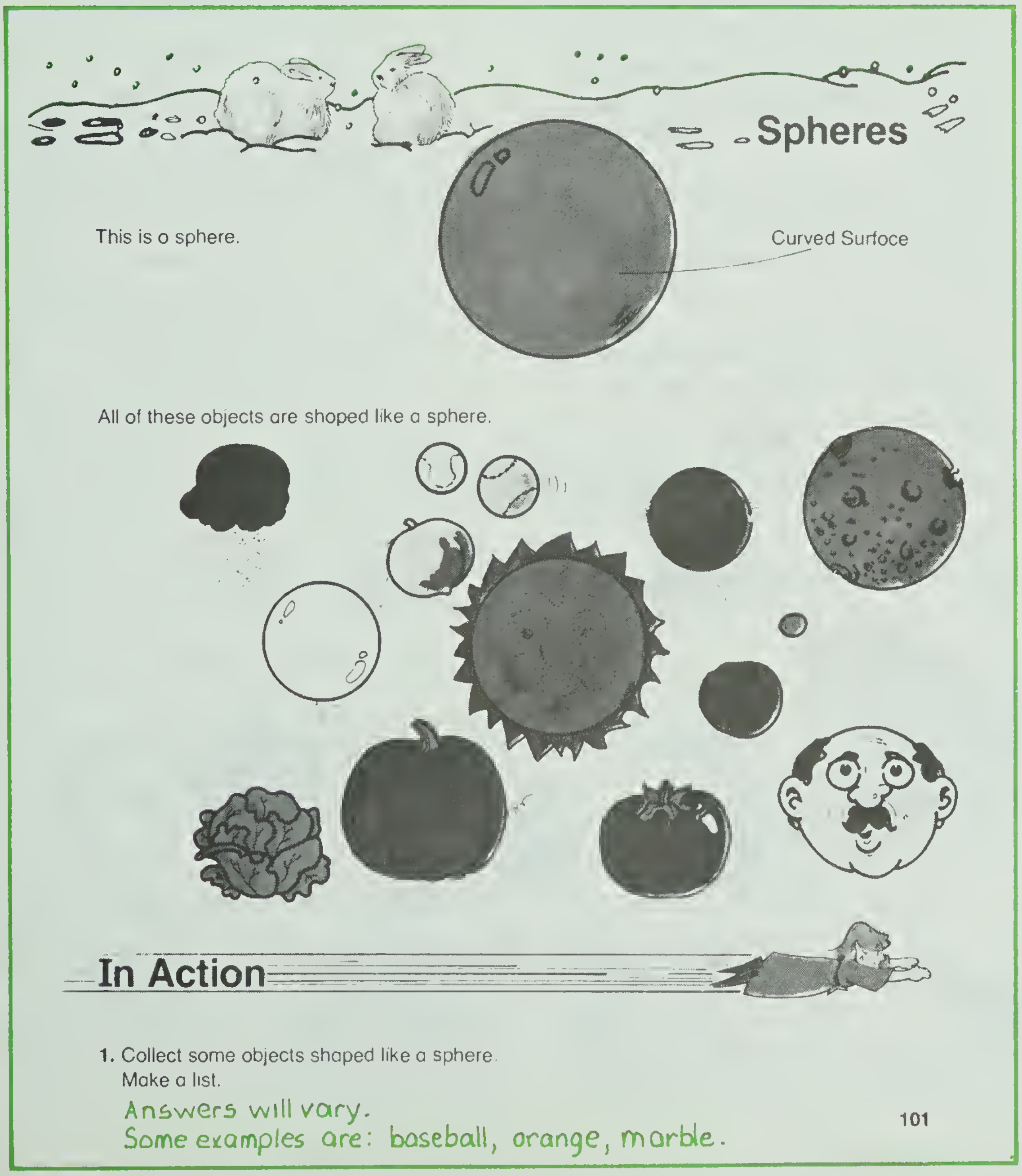
Have the children cut pictures of spherical objects from magazines, showing how spheres are used. If desired, have the children mount the pictures on paper or lightweight cardboard and create a display on the bulletin board or in a prominent location in the classroom.

3

Label geometric solids or pictures of solids. Pairs of children use them to play a game in which one child names two solids and the other child states their likenesses and differences.

4

Have the children make model spheres from Plasticine, modelling clay or papier-mâché.



Spheres

This is a sphere.

Curved Surface

All of these objects are shaped like a sphere.

In Action

1. Collect some objects shaped like a sphere. Make a list.

Answers will vary.
Some examples are: baseball, orange, marble.

101

Written and Other Activities

☐

mathways 3, page 101

Discuss the reason why there are no directions given for making a sphere. Invite comments on the objects pictured, asking, for example, *Are you surprised to know that a head of lettuce is a sphere, Martin? Why?* For exercise 1, encourage the children to list as many examples as they can think of.

☐ ☐

Have children experiment with labelled models of solids. Each child chooses one model and compares it with each of the others, telling how the models differ and how they are alike.

☐ ☐ ☐

Have the children sort a set of the five geometric models into groups and explain their sorting rule. Vary the activity by having the children sort the models according to a certain property, such as

- curved surface, no curved surfaces
- square faces, no square faces
- vertices, no vertices
- rolls, will not roll
- stacks, will not stack

☐ ☐ ☐ ☐

Have the children make charts such as the following:

Models	Likenessess	Differences
Cones and cylinders		

Note: The children may be unable to complete every section.

☐ ☐ ☐ ☐ ☐

Have the children play a game in which one child names the properties of a given solid and another child names the solid. For example, a child says,

I am thinking of a solid that has one round face and one vertex.
What solid am I thinking of?

The child who answers correctly makes the next statement.

☐ ☐ ☐ ☐ ☐ ☐

Choose a sorting rule and sort a set of geometric models. Have the children guess your sorting rule.

☐ ☐ ☐ ☐ ☐ ☐ ☐

Use some of the suggestions given on TN pages 99, 100 and 101 of this manual for an art lesson.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

You may wish to send home a letter to keep parents informed of what is happening in the mathematics class. The following may serve as a model.

Dear Parent or Guardian;
Recently we've been having fun learning about some very special solids. You can learn about these important models by looking at mathways pages 96 to 101. There you will see patterns and suggestions for making a cone, cylinder, prism and cube. We have been making these at school. Perhaps you and your child would like to make a set for home discussion. It doesn't matter about the size – large or small models will work just as well.
There are other ways you can help. Find objects around home which are shaped like your models. Talk about them. Look for models outdoors too. Ask your child questions such as: "This flower stem is shaped like which solid?"
Help your child use the correct language with each solid. This might be one place where your child could become the teacher and you the learner!
The school very much appreciates your interest. Call if you have any questions.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 18

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mathways 3 Plus Workbook page 26

For Your Notes

Unit 2 Section 2 Lesson 6

Recalling Centimetres, Money, Fractions, Decimals and Geometric Solids, Solving Word Problems

PROBLEM SOLVING

Materials

- for each child
  - centimetre ruler
- real or play money

Rationale

This page is designed to provide children with an opportunity to recall and strengthen concepts and skills acquired in working through previous lessons.

Lesson

1

Prepare the children for successfully completing pages 102 and 103 by briefly discussing each topic. If the discussion reveals that particular skills and concepts need recalling, select appropriate activities, such as those described on previous TN pages, for review. The children may recall amounts of money more effectively if they are encouraged to work with play or real money.

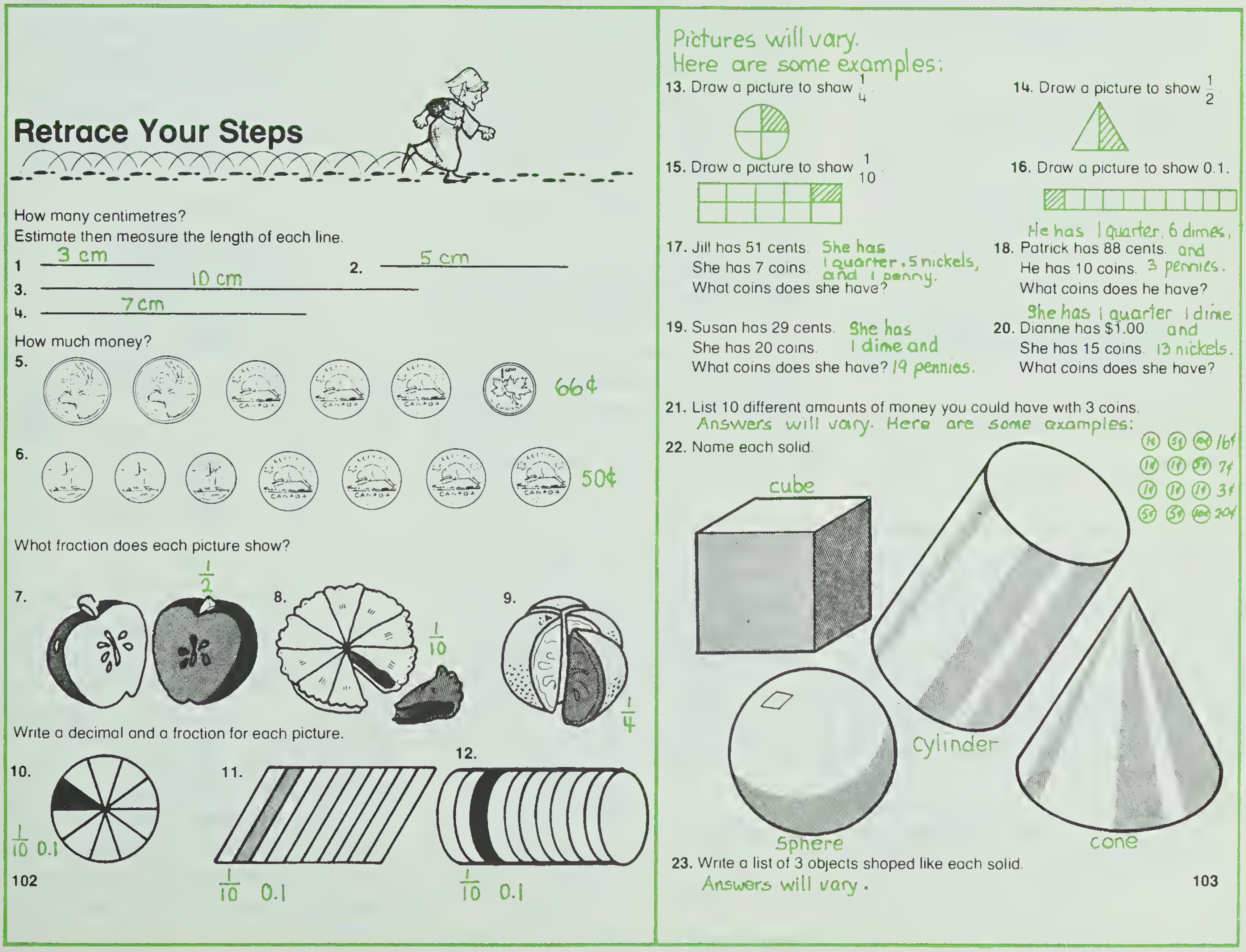
Written and Other Activities

☐

mathways 3, pages 102, 103

☐ ☐

For further review, have pairs of children make up and solve problems similar to those given on pages 102 and 103. For example, each partner could write out two or three problems on a sheet of paper and give it to the other partner to solve. The children could exchange papers again and check each other's answers.



Retrace Your Steps

How many centimetres?
Estimate then measure the length of each line.

1. 3 cm
2. 5 cm
3. 10 cm
4. 7 cm

How much money?

5. 66¢
6. 50¢

What fraction does each picture show?

7. $\frac{1}{2}$
8. $\frac{1}{10}$
9. $\frac{1}{4}$

Write a decimal and a fraction for each picture.

10. $\frac{1}{10}$ 0.1
11. $\frac{1}{10}$ 0.1
12. $\frac{1}{10}$ 0.1

102

Pictures will vary.
Here are some examples:

13. Draw a picture to show $\frac{1}{4}$.
14. Draw a picture to show $\frac{1}{2}$.
15. Draw a picture to show $\frac{1}{10}$.
16. Draw a picture to show 0.1.

17. Jill has 51 cents. She has 7 coins. What coins does she have? She has 1 quarter, 5 nickels, and 1 penny.

18. Patrick has 88 cents. He has 10 coins. What coins does he have? He has 1 quarter, 6 dimes, and 3 pennies.

19. Susan has 29 cents. She has 20 coins. What coins does she have? She has 1 dime and 19 pennies.

20. Dianne has $1.00. She has 15 coins. What coins does she have? She has 1 quarter 1 dime and 13 nickels.

21. List 10 different amounts of money you could have with 3 coins.
Answers will vary. Here are some examples:
1¢ 5¢ 10¢ 16¢
1¢ 1¢ 5¢ 7¢
1¢ 1¢ 1¢ 3¢
5¢ 5¢ 10¢ 20¢

22. Name each solid.
cube
cylinder
sphere
cone

23. Write a list of 3 objects shaped like each solid.
Answers will vary.

103

Unit 2 Art Ideas

Rationale

Combining geometry and art has the dual benefit of reinforcing concepts and skills needed in geometry and providing a focus for developing a variety of artistic skills. Interesting art can result from drawing objects that resemble any of the five geometric solids, from tracing the faces of models or from constructing models and decorating them.

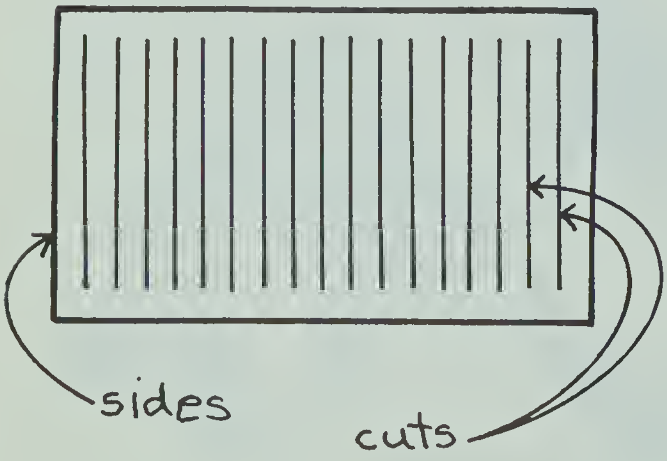
Some of the ideas presented on these pages could be used for art lessons at the same time as the children are working through Section 2. Others can be used earlier to provide an interesting introduction to geometry. Many can be used later, when they fit naturally into the art curriculum; in this case, the art lessons will provide an effective and enjoyable vehicle for reviewing concepts.

1

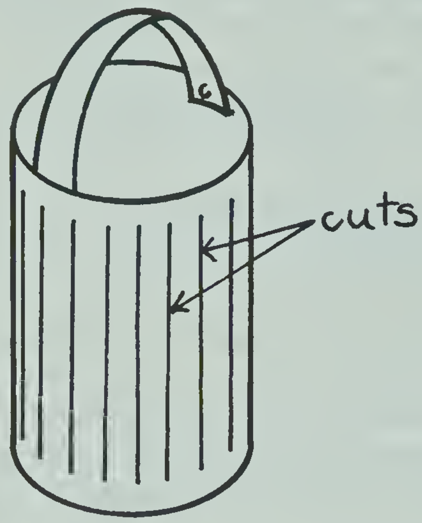
The children may enjoy making lanterns for special occasions such as Hallowe'en, Christmas or a class party.

Cut a rectangular region of paper. The size of the rectangle will vary depending on the desired size of the lantern. For a Hallowe'en lantern a 20 cm by 30 cm rectangle would be appropriate; for a Christmas tree decoration a 10 cm by 36 cm rectangle would be effective.

Make cuts in the rectangle as shown.



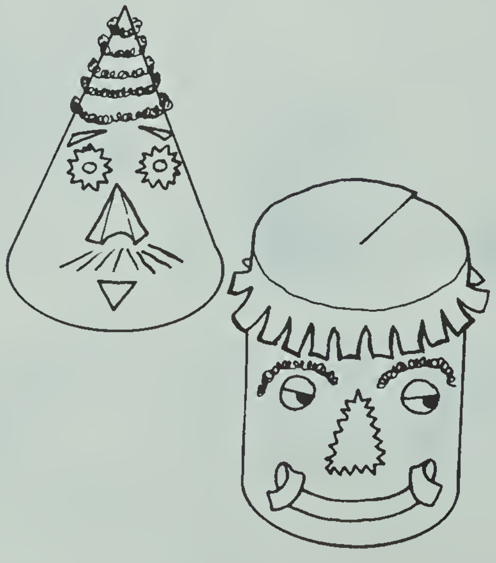
Roll the paper and tape the marked sides together. Make a handle for the lantern.



2

The children can make characters by decorating solids made from construction paper. The characters might be animals, such as those at the top of the children's text pages, insects, cartoon characters or imaginary creatures. At Hallowe'en and Christmas, the characters can be goblins and Santas.

Using construction paper and the directions on children's text pages 96 to 100, make a cone, cylinder, prism or cube. A larger pattern than the one shown may be needed for making a prism or cube. Decorate the solid with scraps of material or paper and items such as pipe cleaners and toothpicks.



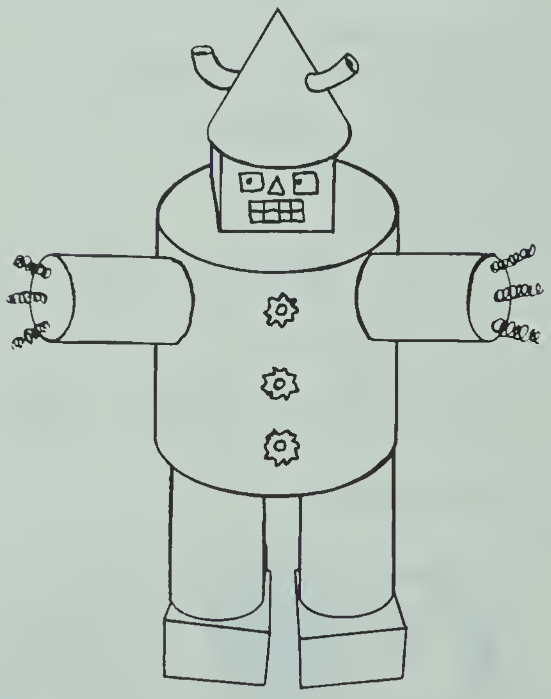
3

Have the children make characters by decorating papier-mâché spheres. Have each child double a piece of newspaper into a ball. Each child tears newspapers into narrow strips – 3 cm width works well – and after dipping a strip into wallpaper paste, folds it around the ball. The children continue dipping and folding until they have spheres of appropriate size. When the paste is dry, paint the model and decorate it as the face of any animal shown at the tops of the children's text pages or as any other creature.

4

The children can make animals or robots by combining several small three-dimensional models.

Make various models according to the directions given on text pages 96 to 100. Glue the solids together in the shape of an animal or robot and decorate with scraps of material, paper, toothpicks, pasta or pipe cleaners.



5

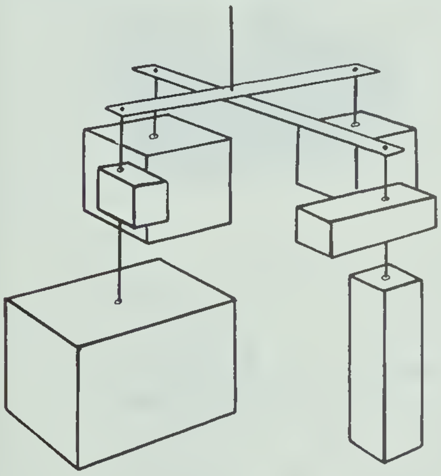
Some children might enjoy making trucks and vans while the other children make characters.

Make three-dimensional solids and glue them together in the shape of a vehicle. Decorate with buttons, beans, pasta or toothpicks and scraps of material.

6
Solids can be the buildings along a street or in a neighbourhood. Groups of children can construct different neighbourhoods. Solids to be used as buildings should be 8 cm to 12 cm high.

Paint a sheet of cardboard or Bristol board to show streets, grass, sidewalks and whatever other details characterize the neighbourhood. Arrange the solids as buildings and decorate them to form windows, shutters, doors. The landscape can be filled in by making flowers, benches or streetlights.

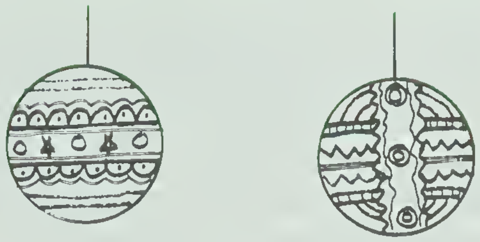
7
Have a few children work together to make a mobile. Make three-dimensional solids or use the models made during math lessons. The mobiles can consist of a single solid in various sizes or they can be made of different solids. Attach the solids together and label them with the name(s) of the solid(s) used.



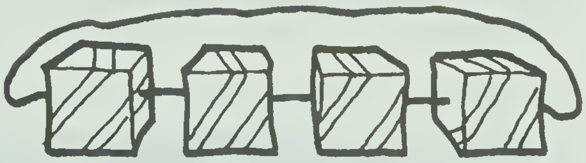
8
Children will enjoy making dice to be used in lessons and games. Make two cubes as shown on children's text page 100. Mark the faces of the cubes to fit the game or lesson.

9
Make Christmas tree ornaments for the classroom or for home.

Make a small prism or sphere with construction paper or papier-mâché. Decorate it with paint, ribbon or painted string and scraps of material or paper.



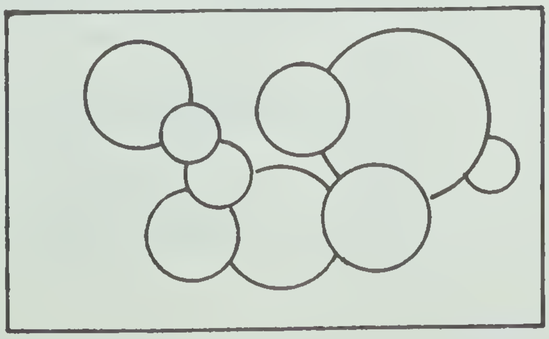
10
Making jewellery to give as gifts may be of interest to the children. Tear newspaper into very small strips and combine the strips with wallpaper paste to make small spheres or cubes. When the paste is dry, puncture each solid with a needle and paint it. String the jewels together to create a necklace or bracelet.



11
The children may enjoy making designs made up of geometric regions traced from the faces of solids. Choose a figure from the chart below.

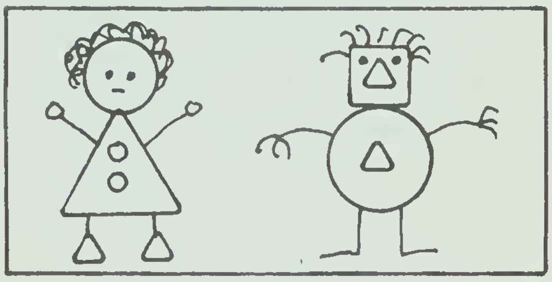
Face	Solid
circle	cylinder or cone
rectangle	rectangular prism
square	cube

To make the regions, trace the faces of solids of various sizes and cut them out. Arrange the regions on a sheet of construction paper to form a design. Designs can be made more interesting if the figures overlap. Paste the regions onto the construction paper.



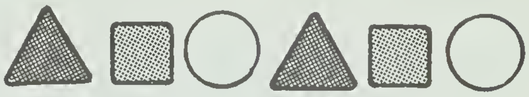
12
The children can make a variety of pictures by tracing the faces of solids. Appealing themes could come from the art on the children's text pages in Section 2.

On a sheet of construction paper trace the faces of a variety of solids, colour the regions formed and add details to create a picture.



13
Have the children create patterns made up of geometric regions and colours on cards. Display the cards and have each child choose one pattern to continue on another sheet of paper.

14
Have the children trace and colour in the faces of several different solids to create patterns.



15
The children can make animal tracks such as those shown on children's text pages 96 to 101.

On a sheet of construction paper trace the faces of solids to form animal tracks. Colour or paint the tracks and the background.

16
The children can use a potato to print a pattern of animal paws. Cut a potato in half. On one half of the potato carve out circles, squares, rectangles and triangles. Dip the carved half in paint and press it on construction paper several times to create a pattern of paw prints.

Unit 2 Section 3 Lesson 1

Recalling Addition and Subtraction Facts Using Number Pairs

Materials

- blank cards for making flash cards
- dice, several sets marked 5 to 10 and 8 to 12

Rationale

Pairs of numbers are an effective means of reinforcing, first addition and subtraction facts, and later, multiplication and division facts. The goal is to have the children respond to a pair automatically. For example, when children who are thinking of addition see the pair of numbers (7, 6) they automatically think *13*, rather than *Seven plus six is thirteen*. This kind of rapid recall is of great benefit when performing any kind of calculation.

Lesson

1

Gather the children around the easel. Begin by discussing pairs of familiar objects, such as gloves, skates, socks and so on. Ask how many objects are in any of these pairs.

Ask the children how many numbers they would expect to find in a pair of numbers.

2

Beside the term *number pair* write (7,1) and identify it as a number pair. Point out the parentheses and comma and discuss their functions: the parentheses show that the numbers are together, and the comma separates them.

4

Have children write other number pairs on the easel.

5

Tell the children to think about addition. Then point to each pair of numbers on the easel and have the children give the sum without stating the addends.

6

Explain that number pairs can also be used for subtraction. In subtraction the second number is always less than the first. Then, have the children write number pairs suitable for subtraction on the easel. Point to each pair and have children give the difference without stating the minuend and subtrahend.

7

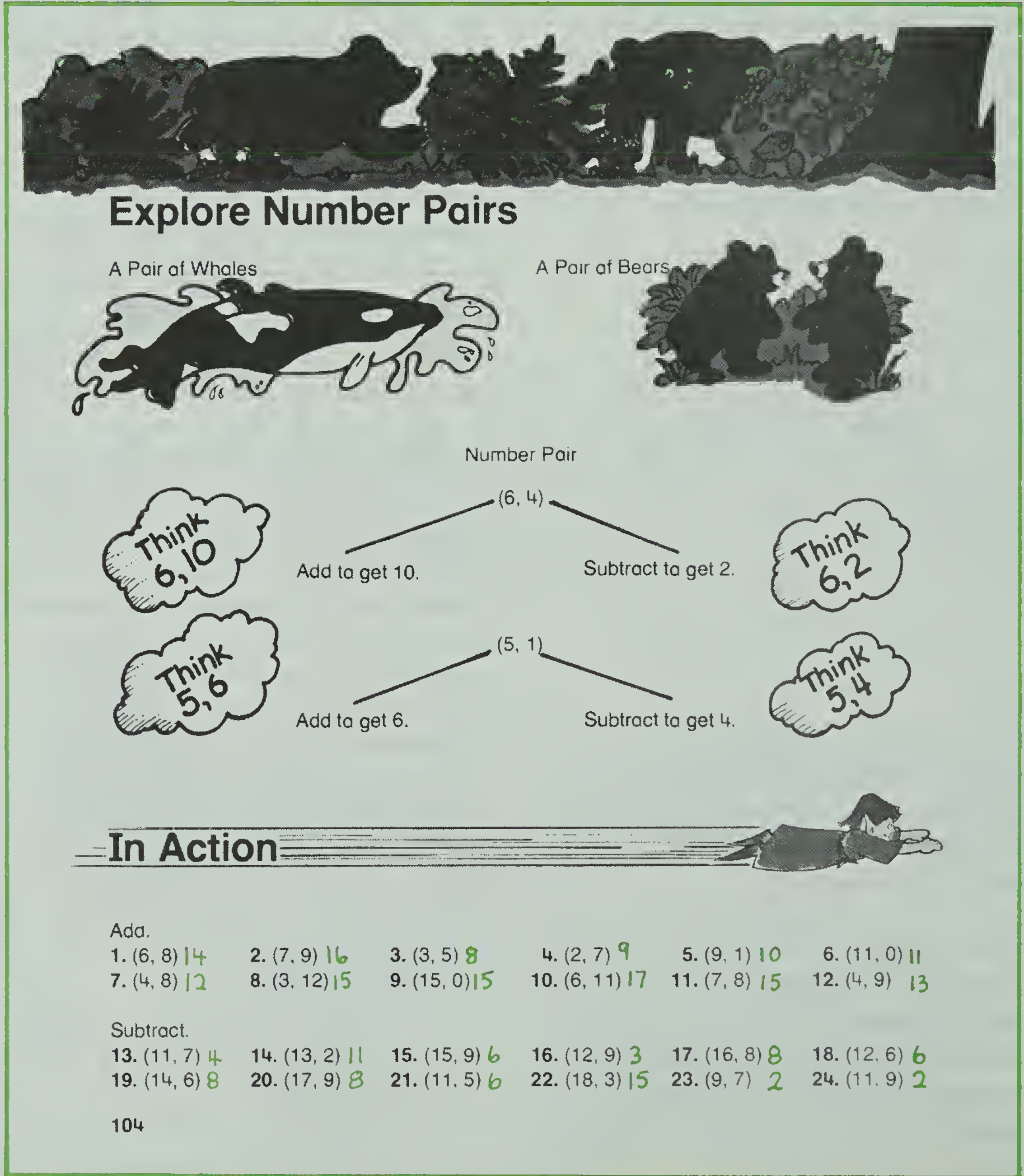
Distribute blank cards, and have the children make sets of flash cards by writing on each an addition or subtraction fact that they have difficulty with. Pair the children and have partners take turns showing each other's cards and asking for sums and differences.

Written and Other Activities

☐

mathways 3, pages 104, 105

Before assigning the pages, discuss each pair of numbers. Remind the children to look at a pair and give only the sum or difference, without stating the numbers in the pair. When assigning the In Action exercises, tell the children to write down only the sum for exercises 1 to 12 and only the differences for exercises 13 to 24. Provide the children with dice for doing exercise 25. Tell the children that they may write the number pair and beside it, the sum or difference when doing exercises 26 to 31 on page 105.



Explore Number Pairs

A Pair of Whales

A Pair of Bears

Number Pair

(6, 4)

Think 6,10

Add to get 10.

Subtract to get 2.

Think 6,2

(5, 1)

Think 5,6

Add to get 6.

Subtract to get 4.

Think 5,4

In Action

Add.

1. (6, 8) 14　**2.** (7, 9) 16　**3.** (3, 5) 8　**4.** (2, 7) 9　**5.** (9, 1) 10　**6.** (11, 0) 11
7. (4, 8) 12　**8.** (3, 12) 15　**9.** (15, 0) 15　**10.** (6, 11) 17　**11.** (7, 8) 15　**12.** (4, 9) 13

Subtract.

13. (11, 7) 4　**14.** (13, 2) 11　**15.** (15, 9) 6　**16.** (12, 9) 3　**17.** (16, 8) 8　**18.** (12, 6) 6
19. (14, 6) 8　**20.** (17, 9) 8　**21.** (11, 5) 6　**22.** (18, 3) 15　**23.** (9, 7) 2　**24.** (11, 9) 2

104

☐ ☐

Have the children compare their answers to exercises 26 to 31 on page 105 and discuss the reasons why there can be different correct answers.

☐ ☐ ☐

Have the children use the marked dice to practise adding and subtracting number pairs. For each pair of numerals on the dice, have them give both the sum and the difference.

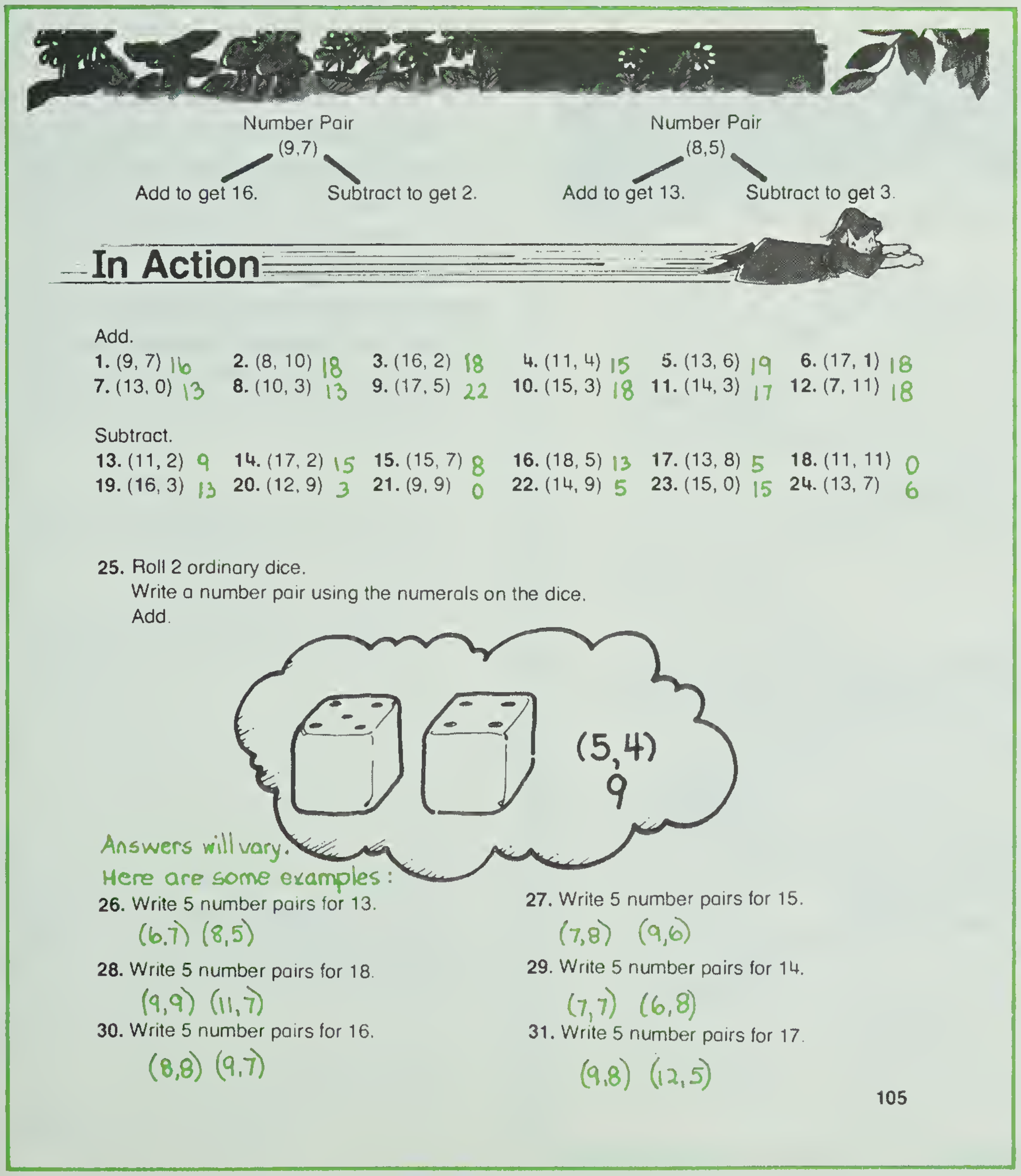
☐ ☐ ☐ ☐

For enrichment, have the children fill in the following chart by writing a pair of numbers for each sum or difference.

Number Pair	Sum	Difference
	9	3
	8	4
	10	0
	6	2
	6	4
	17	1
	16	8
	16	16
	9	5
	16	4
	16	6

☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 19



Number Pair (9,7)
Add to get 16.
Subtract to get 2.

Number Pair (8,5)
Add to get 13.
Subtract to get 3.

In Action

Add.

1. (9, 7) 16 **2.** (8, 10) 18 **3.** (16, 2) 18 **4.** (11, 4) 15 **5.** (13, 6) 19 **6.** (17, 1) 18
7. (13, 0) 13 **8.** (10, 3) 13 **9.** (17, 5) 22 **10.** (15, 3) 18 **11.** (14, 3) 17 **12.** (7, 11) 18

Subtract.

13. (11, 2) 9 **14.** (17, 2) 15 **15.** (15, 7) 8 **16.** (18, 5) 13 **17.** (13, 8) 5 **18.** (11, 11) 0
19. (16, 3) 13 **20.** (12, 9) 3 **21.** (9, 9) 0 **22.** (14, 9) 5 **23.** (15, 0) 15 **24.** (13, 7) 6

25. Roll 2 ordinary dice.
Write a number pair using the numerals on the dice.
Add.

(5,4)
9

Answers will vary.
Here are some examples:

26. Write 5 number pairs for 13.
(6,7) (8,5)

27. Write 5 number pairs for 15.
(7,8) (9,6)

28. Write 5 number pairs for 18.
(9,9) (11,7)

29. Write 5 number pairs for 14.
(7,7) (6,8)

30. Write 5 number pairs for 16.
(8,8) (9,7)

31. Write 5 number pairs for 17.
(9,8) (12,5)

105

For Your Notes

Unit 2 Section 3 Lesson 2

Byway: Using Number Pairs to Add and Subtract

Rationale

This page is designed to accommodate individual differences in ability. Children who have a great deal of skill in adding and subtracting may be able to generate several pairs of numbers from one original pair, despite the fact that the numbers are becoming greater. Others may be able to generate fewer pairs of numbers from an original, but after finding a few sums and differences, they may notice a pattern emerging in the resulting new pairs. Thus practice will help them to gain confidence and greater skill.

Lesson

1

Gather the children around the easel. Write the pair of numbers

(5,0)

and ask one child to give the sum and another the difference. Record each answer below its counterpart in the original pair. Add the parentheses and comma, and explain that the two numbers form a new number pair: (5,5). Ask children for the sum and difference of the new pair and record their answers. Continue the procedure until the pattern becomes evident:

(5,0)
(5,5)
(10,0)
(10,10)
(20,0)
(20,20)
(40,0)
(40,40)

2

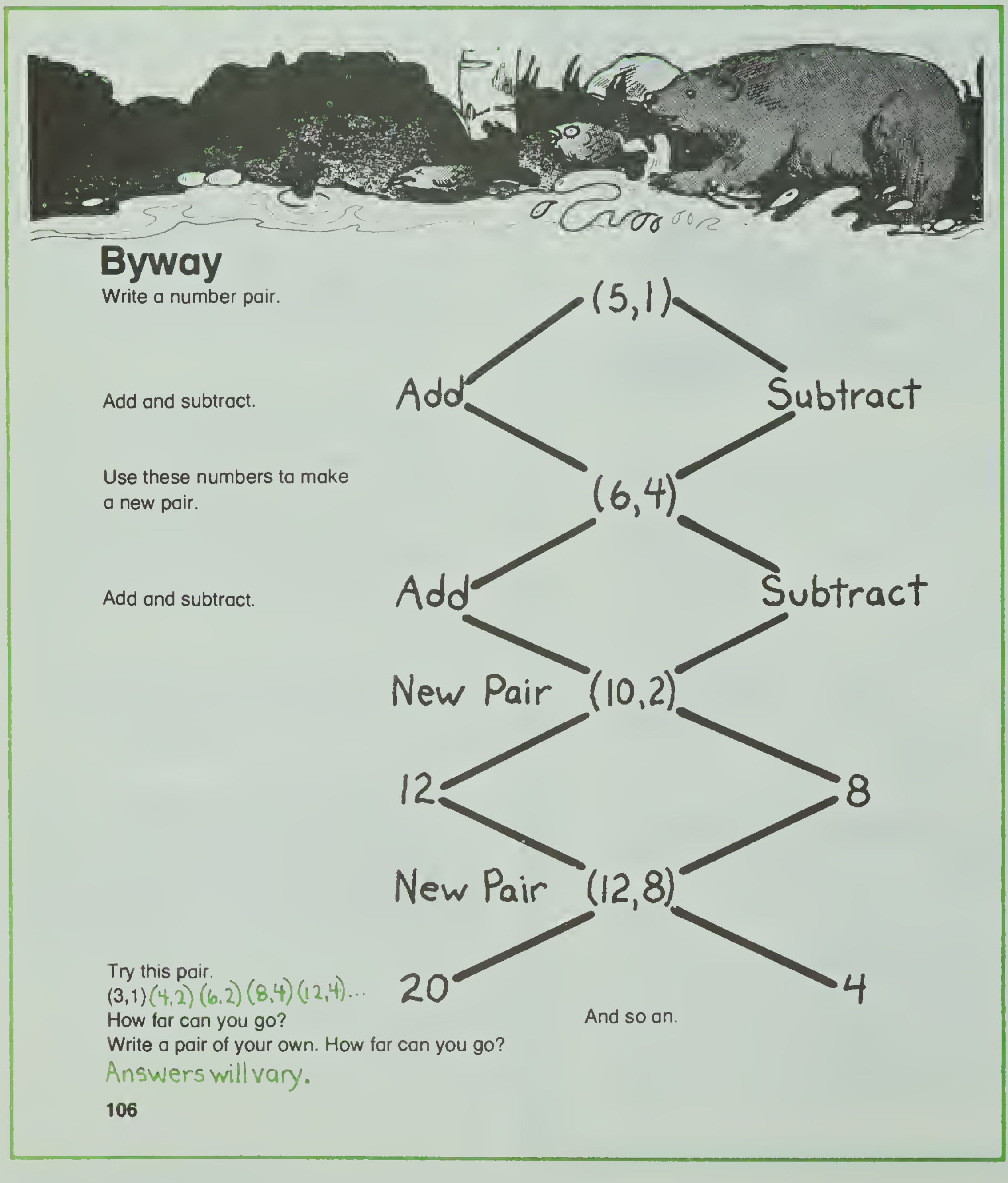
Discuss the pattern in the pairs of numbers. Ask children to predict what the next four pairs will be and record their answers. Then verify the answers by having children add and subtract.

Written and Other Activities

☐

mathways 3, page 106

Have the children continue generating new pairs of numbers for the example given and record them on the easel. Discuss patterns, even though the resulting pattern is more difficult than the one that results from the pair (5,0). Ask children to try to predict the next two or three pairs of numbers. Record their predictions and check them by adding and subtracting. The children may wish to try this activity with several other pairs of numbers.



Byway

Write a number pair.

Add and subtract.

Use these numbers to make a new pair.

Add and subtract.

And so on.

Try this pair.
(3,1) (4,2) (6,2) (8,4) (12,4)...
How far can you go?
Write a pair of your own. How far can you go?
Answers will vary.

106

Unit 2 Section 3 Lesson 3

Exploring Extensions: Number Charts

Materials

- One Hundred Board

Rationale

Extensions of basic addition and subtraction facts provide children with an apparatus for adding and subtracting without going through the regrouping process. Familiarity with extension patterns builds confidence and speeds progress in performing these basic operations and prepares the ground for later work with multiplication and division.

Lesson

1

Gather the children around the easel. Write an extension that requires no regrouping:

3 + 6 = ____
13 + 6 = ____
23 + 6 = ____

Have children use the One Hundred Board to find the sums and fill in the answers. Discuss and point out the repetition in the ones digit. Show the pattern on the One Hundred Board so that the children can see that the three sums on the easel are found in the same column on the Board.
Continue the activity, extending the pattern from
33 + 6 = 39 to 93 + 6 = 99
Build other extensions that do not require regrouping.

2

Write an extension that requires regrouping:

7 + 8 = ____
17 + 8 = ____
27 + 8 = ____
⋮
87 + 8 = ____

Have children find the sums on the One Hundred Board and write the answers on the easel. Again discuss the pattern, pointing it out on the easel and on the Board.

3

Write a subtraction extension that requires no regrouping:

8 − 4 = ____
18 − 4 = ____
28 − 4 = ____

Have children use the One Hundred Board to find the sums and fill in the answers on the easel. Discuss the pattern, drawing a parallel with addition extensions so that the children can see that again the ones digit is repeated and that all the differences in the extension can be found in the same column of the One Hundred Board.
Extend the pattern from
38 − 4 = 34 to 98 − 4 = 94

4

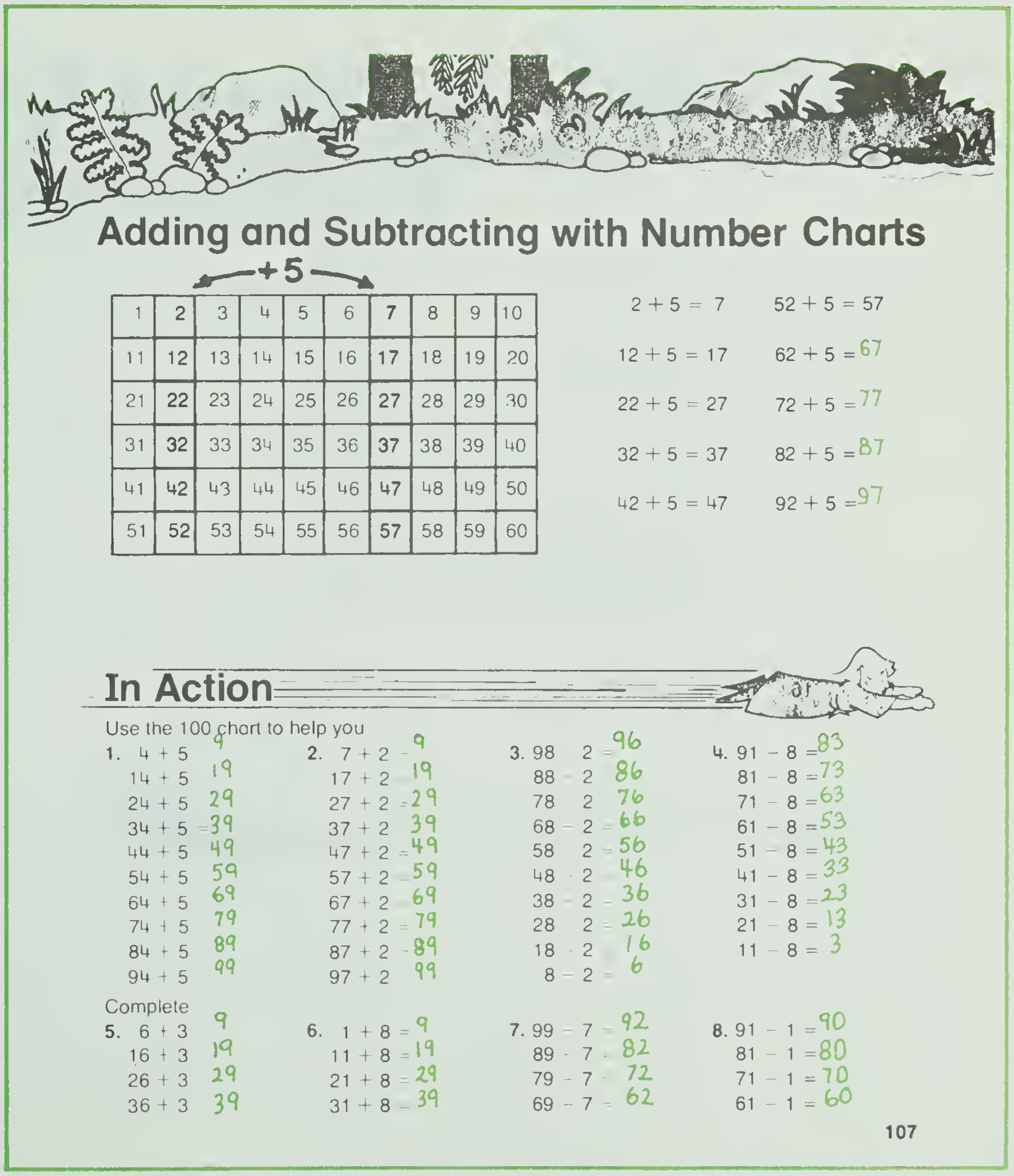
Write a subtraction extension that requires regrouping:

11 − 6 = ____
21 − 6 = ____
31 − 6 = ____
⋮
91 − 6 = ____

Repeat the procedure outlined in the previous steps.

Written and Other Activities

☐
mathways 3, page 107
Before assigning the In Action exercises, have children use the number chart on page 107 to answer the example questions. Allow time for discussion of the results and the parallel between the number chart and the One Hundred Board.



Adding and Subtracting with Number Charts

+5

1	**2**	3	4	5	6	**7**	8	9	10
11	**12**	13	14	15	16	**17**	18	19	20
21	**22**	23	24	25	26	**27**	28	29	30
31	**32**	33	34	35	36	**37**	38	39	40
41	**42**	43	44	45	46	**47**	48	49	50
51	**52**	53	54	55	56	**57**	58	59	60

2 + 5 = 7
12 + 5 = 17
22 + 5 = 27
32 + 5 = 37
42 + 5 = 47

52 + 5 = 57
62 + 5 = 67
72 + 5 = 77
82 + 5 = 87
92 + 5 = 97

In Action

Use the 100 chart to help you

1. 4 + 5 = 9
14 + 5 = 19
24 + 5 = 29
34 + 5 = 39
44 + 5 = 49
54 + 5 = 59
64 + 5 = 69
74 + 5 = 79
84 + 5 = 89
94 + 5 = 99

2. 7 + 2 = 9
17 + 2 = 19
27 + 2 = 29
37 + 2 = 39
47 + 2 = 49
57 + 2 = 59
67 + 2 = 69
77 + 2 = 79
87 + 2 = 89
97 + 2 = 99

3. 98 − 2 = 96
88 − 2 = 86
78 − 2 = 76
68 − 2 = 66
58 − 2 = 56
48 − 2 = 46
38 − 2 = 36
28 − 2 = 26
18 − 2 = 16
8 − 2 = 6

4. 91 − 8 = 83
81 − 8 = 73
71 − 8 = 63
61 − 8 = 53
51 − 8 = 43
41 − 8 = 33
31 − 8 = 23
21 − 8 = 13
11 − 8 = 3

Complete

5. 6 + 3 = 9
16 + 3 = 19
26 + 3 = 29
36 + 3 = 39

6. 1 + 8 = 9
11 + 8 = 19
21 + 8 = 29
31 + 8 = 39

7. 99 − 7 = 92
89 − 7 = 82
79 − 7 = 72
69 − 7 = 62

8. 91 − 1 = 90
81 − 1 = 80
71 − 1 = 70
61 − 1 = 60

107

Unit 2 Section 3 Lesson 4

Exploring Extensions: Number Charts

Materials

- One Hundred Board
- Program Master 22

Lesson

1

Gather the children around the easel and write on it *31 + 7.* Have the children first state, then record, the extension pattern. Loop the basic fact. For example

1 + 7 = 8
11 + 7 = 18
21 + 7 = 28
31 + 7 = 38
41 + 7 = 48
⋮
91 + 7 = 98

Then have the children point to each of the numbers on the One Hundred Board.

2

Repeat step 1, substituting 68 + 9, 97 − 6, 54 − 5.

3

Write the following questions on the easel: *28 + 7, 32 − 5, 69 − 4, 73 + 9, 92 − 8, 51 + 2.* Have the children write the extension pattern for each question and loop the basic fact, as in the following example:

8 + 7 = 15
18 + 7 = 25
28 + 7 = 35
38 + 7 = 45
48 + 7 = 55
58 + 7 = 65
68 + 7 = 75
78 + 7 = 85
88 + 7 = 95

Written and Other Activities

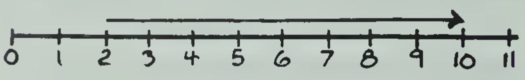
☐

mathways 3, page 108

Before assigning the page, have the children point out the numerals for each of the completed example questions on the 100-chart in the text. Then have them give the sums for the remaining examples.

☐ ☐

Have the children make number lines on which to show addition extensions such as 2 + 8 to 82 + 8. Addition questions are shown by an arrow that extends from the first addend to the sum. For example,



2 + 8 = 10

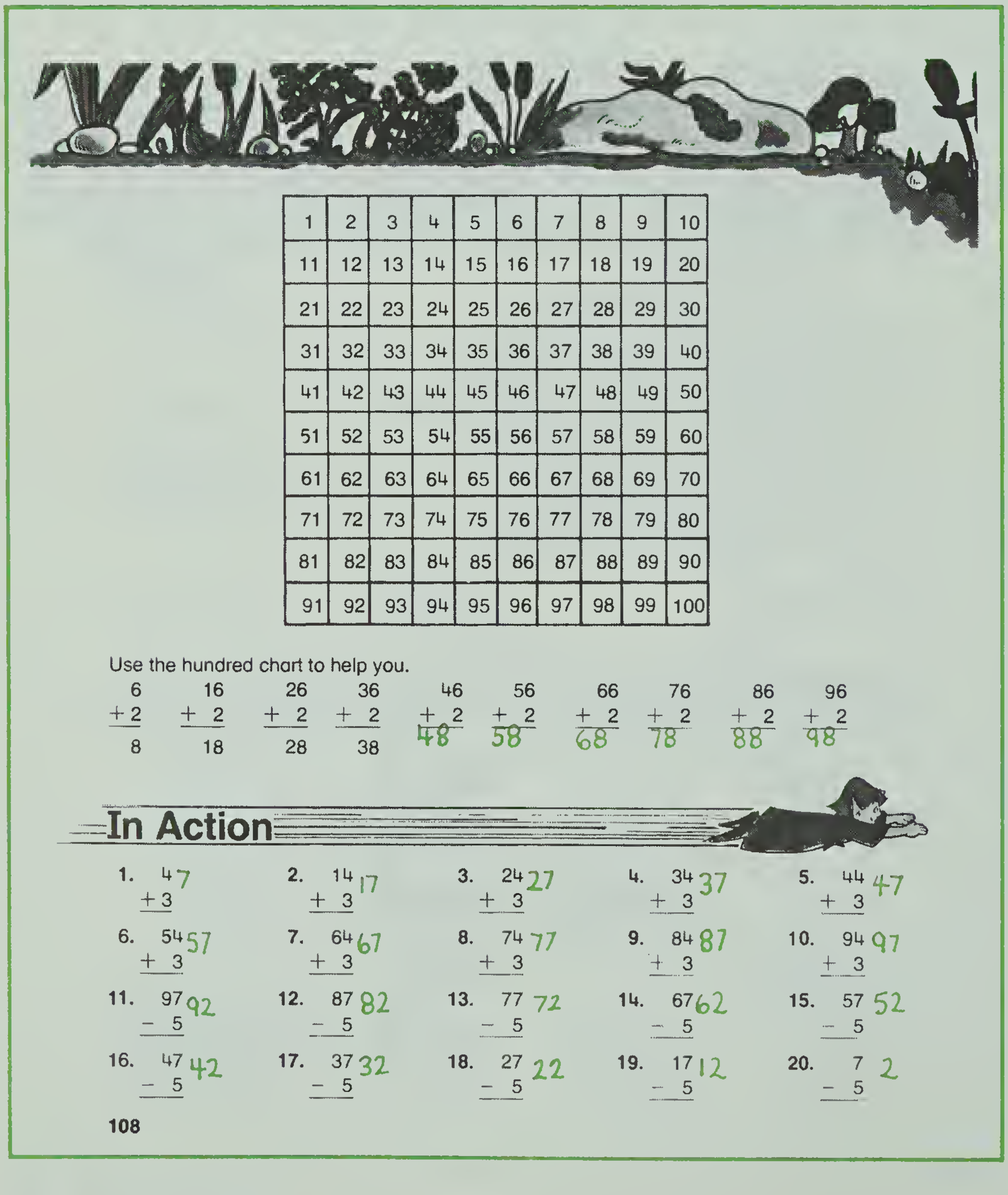
Have the children repeat the activity to show other addition and subtraction questions involving regrouping and no regrouping.

☐ ☐ ☐

Have the children write a basic addition or subtraction fact and develop nine extensions. Distribute copies of Program Master 22 and tell the children to find the numerals for each question and colour the squares to show the extension pattern.

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 27



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Use the hundred chart to help you.

6	16	26	36	46	56	66	76	86	96
+ 2	+ 2	+ 2	+ 2	+ 2	+ 2	+ 2	+ 2	+ 2	+ 2
8	18	28	38	48	58	68	78	88	98

In Action

1. 4 + 3 7	2. 14 + 3 17	3. 24 + 3 27	4. 34 + 3 37	5. 44 + 3 47
6. 54 + 3 57	7. 64 + 3 67	8. 74 + 3 77	9. 84 + 3 87	10. 94 + 3 97
11. 97 − 5 92	12. 87 − 5 82	13. 77 − 5 72	14. 67 − 5 62	15. 57 − 5 52
16. 47 − 5 42	17. 37 − 5 32	18. 27 − 5 22	19. 17 − 5 12	20. 7 − 5 2

108

Unit 2 Section 3 Lesson 5

Extending Basic Facts to Find Sums and Differences

Rationale

Extensions of basic addition facts help children to add a one-digit number to a two-digit number and to subtract a one-digit number from a two-digit number. Remind the children to look at the addition or subtraction question and think of the basic fact on which the extension is based, then use the fact to find the sum or difference. For example, given the question

75 + 9

the children would think of the fact

5 + 9 = 14

and conclude that

75 + 9 = 84.

Lesson

1

Gather the children around the easel and write

52 + 7 = ____.

Ask for the basic addition fact and record it:

2 + 7 = 9.

Ask how this fact can help find the sum of 52 + 7. Manage the discussion to show that since 2 + 7 = 9, 52 + 7 = 59. Have a child record the sum.

Repeat the procedure for questions such as 68 + 5, 25 − 4, 92 − 8.

2

Write

63 + 1

on the easel.

Have a child state the basic fact

3 + 1 = 4

and give the sum for the question:

63 + 1 = 64.

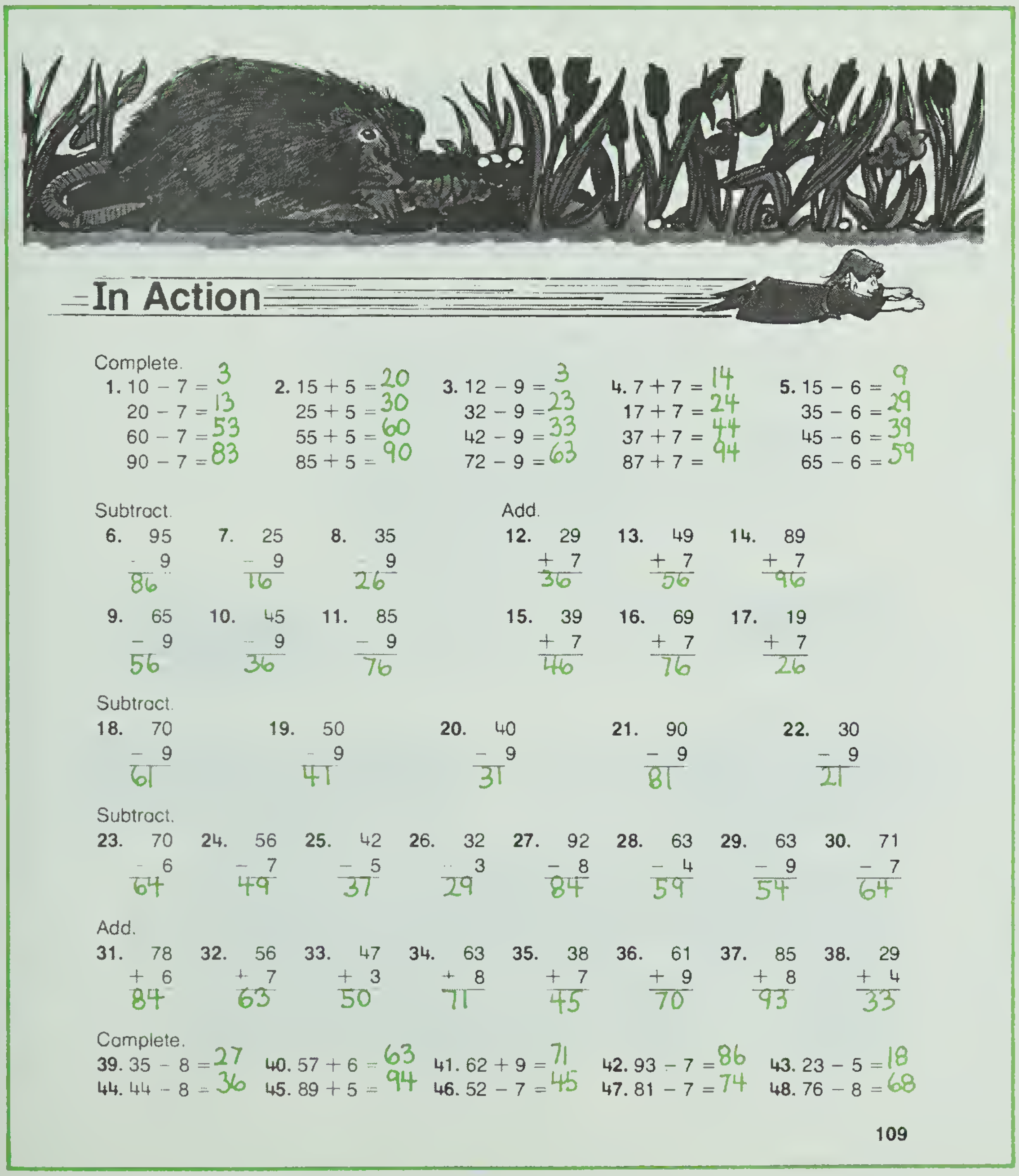
Write several more addition and subtraction questions and repeat the procedure.

3

Write an addition question on the easel in vertical form:

$\begin{array}{r} 37 \\ +\ 6 \\ \hline \end{array}$

Use the procedure given in step 2 to find the sum. Write a subtraction question in vertical form and repeat.



In Action

Complete.

1. 10 − 7 = 3 | 20 − 7 = 13 | 60 − 7 = 53 | 90 − 7 = 83
2. 15 + 5 = 20 | 25 + 5 = 30 | 55 + 5 = 60 | 85 + 5 = 90
3. 12 − 9 = 3 | 32 − 9 = 23 | 42 − 9 = 33 | 72 − 9 = 63
4. 7 + 7 = 14 | 17 + 7 = 24 | 37 + 7 = 44 | 87 + 7 = 94
5. 15 − 6 = 9 | 35 − 6 = 29 | 45 − 6 = 39 | 65 − 6 = 59

Subtract.

6. $\begin{array}{r} 95 \\ -\ 9 \\ \hline 86 \end{array}$ 7. $\begin{array}{r} 25 \\ -\ 9 \\ \hline 16 \end{array}$ 8. $\begin{array}{r} 35 \\ 9 \\ \hline 26 \end{array}$

9. $\begin{array}{r} 65 \\ -\ 9 \\ \hline 56 \end{array}$ 10. $\begin{array}{r} 45 \\ -\ 9 \\ \hline 36 \end{array}$ 11. $\begin{array}{r} 85 \\ -\ 9 \\ \hline 76 \end{array}$

Add.

12. $\begin{array}{r} 29 \\ +\ 7 \\ \hline 36 \end{array}$ 13. $\begin{array}{r} 49 \\ +\ 7 \\ \hline 56 \end{array}$ 14. $\begin{array}{r} 89 \\ +\ 7 \\ \hline 96 \end{array}$

15. $\begin{array}{r} 39 \\ +\ 7 \\ \hline 46 \end{array}$ 16. $\begin{array}{r} 69 \\ +\ 7 \\ \hline 76 \end{array}$ 17. $\begin{array}{r} 19 \\ +\ 7 \\ \hline 26 \end{array}$

Subtract.

18. $\begin{array}{r} 70 \\ -\ 9 \\ \hline 61 \end{array}$ 19. $\begin{array}{r} 50 \\ -\ 9 \\ \hline 41 \end{array}$ 20. $\begin{array}{r} 40 \\ -\ 9 \\ \hline 31 \end{array}$ 21. $\begin{array}{r} 90 \\ -\ 9 \\ \hline 81 \end{array}$ 22. $\begin{array}{r} 30 \\ -\ 9 \\ \hline 21 \end{array}$

Subtract.

23. $\begin{array}{r} 70 \\ -\ 6 \\ \hline 64 \end{array}$ 24. $\begin{array}{r} 56 \\ -\ 7 \\ \hline 49 \end{array}$ 25. $\begin{array}{r} 42 \\ -\ 5 \\ \hline 37 \end{array}$ 26. $\begin{array}{r} 32 \\ 3 \\ \hline 29 \end{array}$ 27. $\begin{array}{r} 92 \\ -\ 8 \\ \hline 84 \end{array}$ 28. $\begin{array}{r} 63 \\ -\ 4 \\ \hline 59 \end{array}$ 29. $\begin{array}{r} 63 \\ -\ 9 \\ \hline 54 \end{array}$ 30. $\begin{array}{r} 71 \\ -\ 7 \\ \hline 64 \end{array}$

Add.

31. $\begin{array}{r} 78 \\ +\ 6 \\ \hline 84 \end{array}$ 32. $\begin{array}{r} 56 \\ +\ 7 \\ \hline 63 \end{array}$ 33. $\begin{array}{r} 47 \\ +\ 3 \\ \hline 50 \end{array}$ 34. $\begin{array}{r} 63 \\ +\ 8 \\ \hline 71 \end{array}$ 35. $\begin{array}{r} 38 \\ +\ 7 \\ \hline 45 \end{array}$ 36. $\begin{array}{r} 61 \\ +\ 9 \\ \hline 70 \end{array}$ 37. $\begin{array}{r} 85 \\ +\ 8 \\ \hline 93 \end{array}$ 38. $\begin{array}{r} 29 \\ +\ 4 \\ \hline 33 \end{array}$

Complete.

39. 35 − 8 = 27 40. 57 + 6 = 63 41. 62 + 9 = 71 42. 93 − 7 = 86 43. 23 − 5 = 18
44. 44 − 8 = 36 45. 89 + 5 = 94 46. 52 − 7 = 45 47. 81 − 7 = 74 48. 76 − 8 = 68

109

Written and Other Activities

☐

mathways 3, page 109

Have the children form groups of three or four. Each group member in turn gives the basic fact needed for finding the sum or difference for one question in the text.

☐ ☐

Have the children write out addition and subtraction questions such as those on page 109. Have them write the basic fact beside each question and record the sum.

☐ ☐ ☐

mathways 3 Practice Masters page 20

☐ ☐ ☐ ☐

mathways 3 Tests 1A, 1B

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 28

U 2 Section 4 Lesson 1

ng Place Value and Writing Numerals: Hundreds

Materials

- place-value mats: tens and ones; hundreds, tens, ones: Program Masters 16 and 17
- place-value materials: Program Masters 19 and 20

Rationale

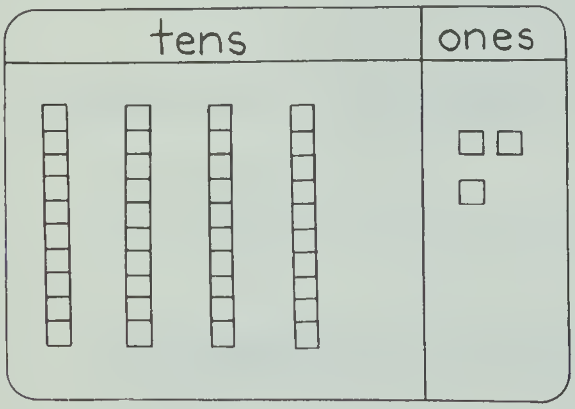
Understanding place value prepares the children for working with whole numbers and decimals and is the basis for comparing and ordering numbers. In addition, place-value activities develop the concepts and skills needed for adding, subtracting, multiplying and dividing.

To assist them in achieving competence with these operations, the children should be given many opportunities to explore and work with a wide variety of place-value materials. Overview page 6 contains suggestions for such materials.

Lesson

1

Invite the children to join you in the working area. Place an appropriate quantity of place-value materials in the centre and give a place-value mat to each child. Have the children use 10-strips and unit strips to show 43.



Ask,

How many tens and ones are shown?

A child responds,

4 tens and 3 ones.

Record on the easel

4 tens and 3

Ask the child what number is represented on the mat.

Forty-three.

Record each response on the easel. Repeat the procedure, asking children to show several two-digit numbers, including some that have zero ones, such as 50.

2

Review the relationship between tens and ones by having a child display 10 unit strips. Ask,

How many ones are shown?

What number is this?

Record responses on the easel.

10 ones

10

Then ask,

How many tens does this mean?

Record

1 ten

Have the children exchange 10 unit strips for one 10-strip. Emphasize that each expression on the easel is a way of representing 10.

3

Extend the concept of place value to hundreds. Have a child display ten 10-strips and ask,

How many tens are shown?

On the easel record

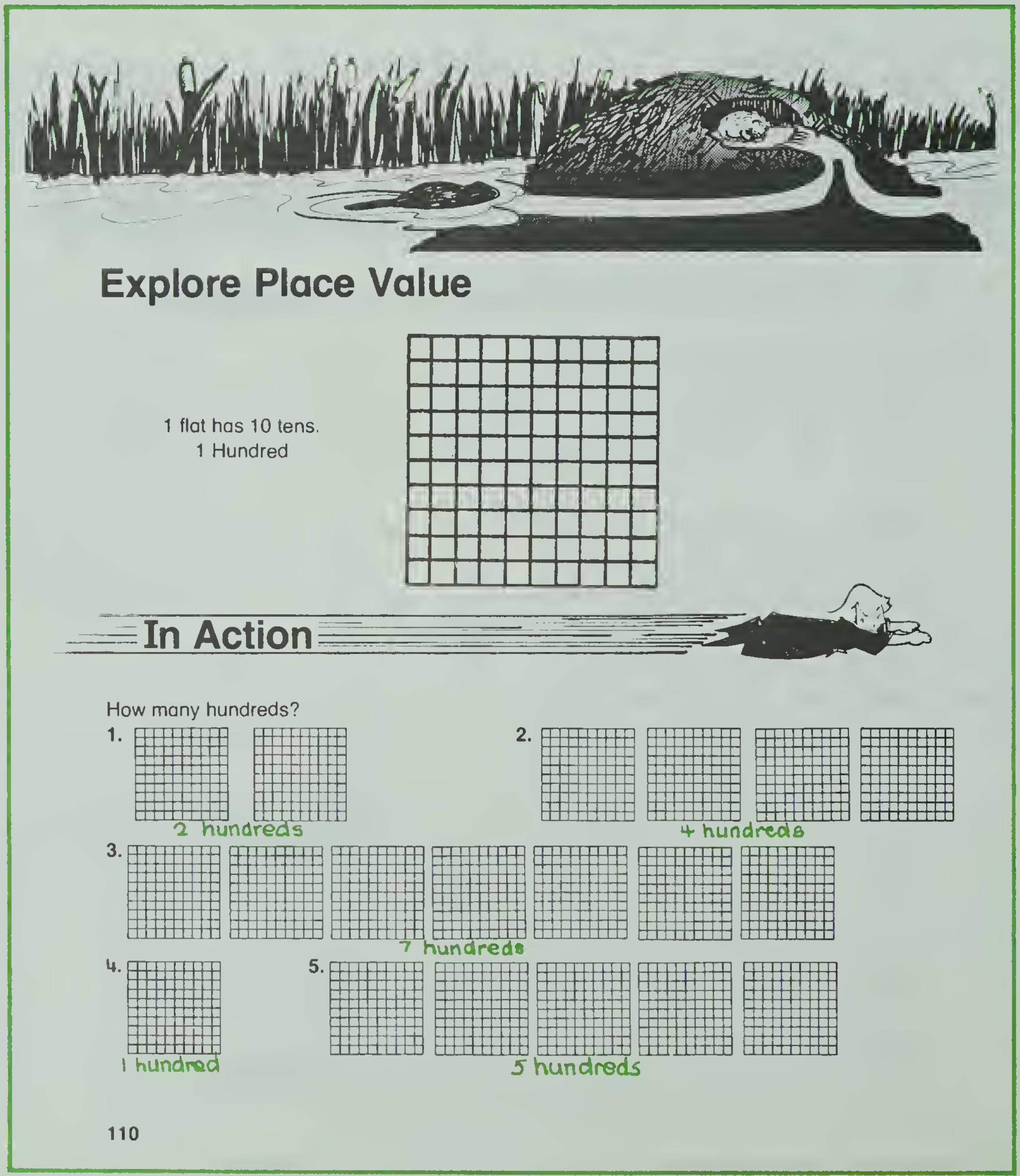
10 tens

Explain that 10 tens are the same as one hundred and write

1 hundred

100

Have the children exchange ten 10-strips for one 100-flat. Emphasize that each expression on the easel is a way of representing 100.



Explore Place Value

1 flat has 10 tens.
1 Hundred

In Action

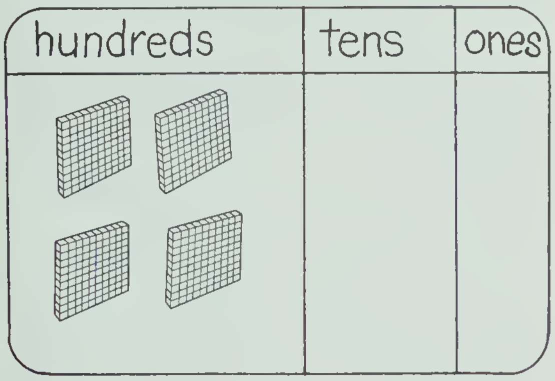
How many hundreds?

1. 2 hundreds
2. 4 hundreds
3. 7 hundreds
4. 1 hundred
5. 5 hundreds

110

4

Have each child place four 100-flats in the hundreds section of a place-value mat.



Ask,

How many hundreds are shown?
What number is this?

Record

4 hundreds
400

Have a child read the number.

Four hundred.

Repeat the procedure for numbers such as 200, 400 and 900.

5

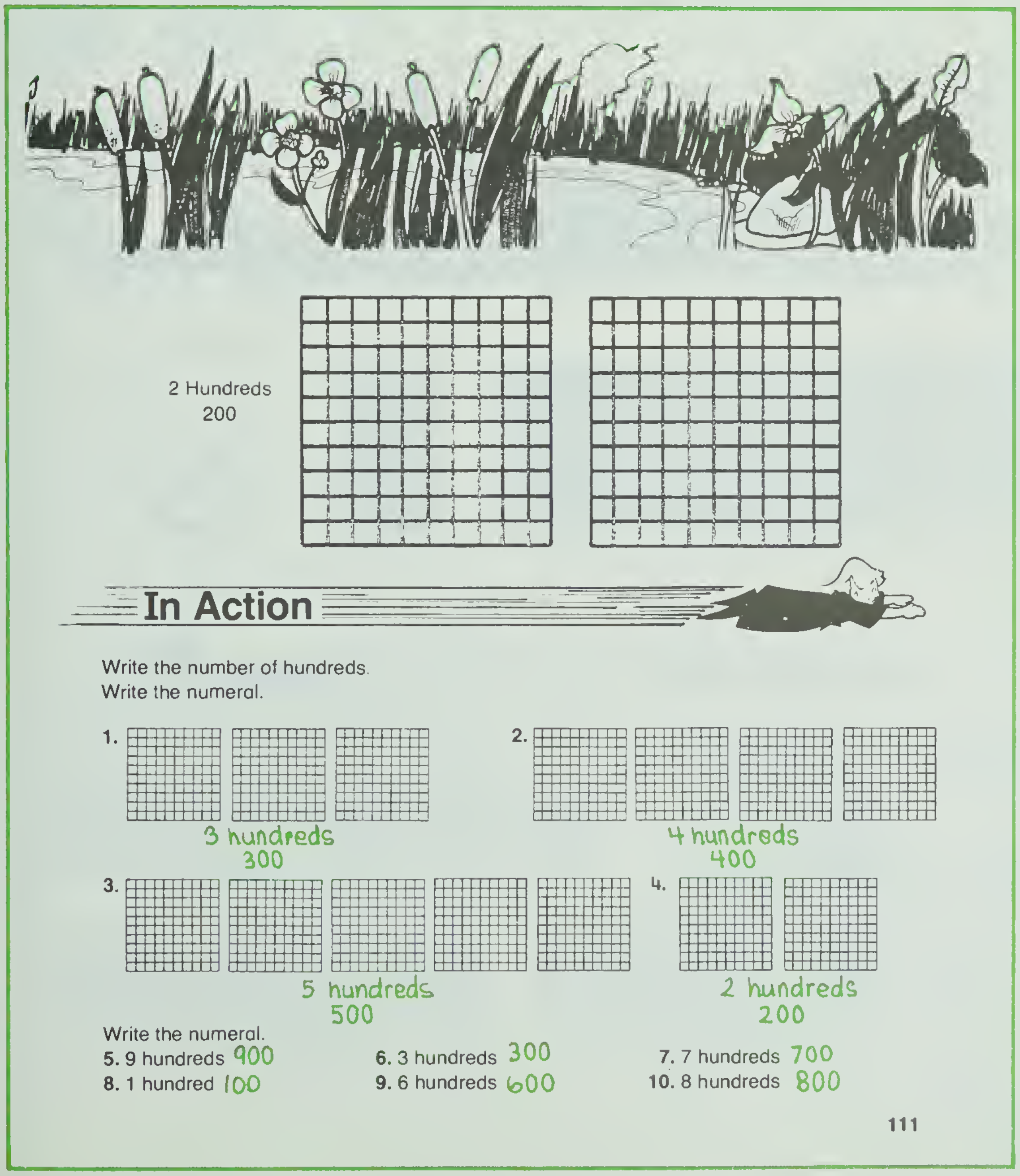
On the easel write

500

Have the children place 100-flats on their place-value mats to show the number. Repeat, asking children to show several hundred-numbers.

6

Show a number on a place-value mat. Have the children say the number and write the numeral on the easel. Have groups of children repeat the activity.



2 Hundreds
200

In Action

Write the number of hundreds.
Write the numeral.

1. 3 hundreds 300
2. 4 hundreds 400
3. 5 hundreds 500
4. 2 hundreds 200

Write the numeral.

5. 9 hundreds 900
6. 3 hundreds 300
7. 7 hundreds 700
8. 1 hundred 100
9. 6 hundreds 600
10. 8 hundreds 800

111

Written and Other Activities

☐

mathways 3, pages 110, 111

Before assigning the pages, discuss the ways in which the numbers have been represented.

☐ ☐

Give the children the opportunity of representing hundreds – 100, 400, 700 – using as great a variety of place-value materials as possible. In addition to commercially made materials, provide strips and flats made from Program Masters 19 and 20, bundles of straws, toothpicks, popsicle sticks, bean sticks and so on. Refer to page 6 of the Overview for a complete description of place-value materials.

Have the children state and write the number that each of the materials used represents.

☐ ☐ ☐

Write numerals on the easel and have children represent them on place-value charts as shown below.

hundreds	tens	ones
3	0	0

☐ ☐ ☐ ☐

Draw a place-value chart on the easel representing several numbers. Have the children say each number, write the numeral and illustrate it using place-value materials on a place-value mat.

Unit 2 Section 4 Lesson 2

Exploring Place Value and Writing Numerals: Hundreds, Tens, Ones

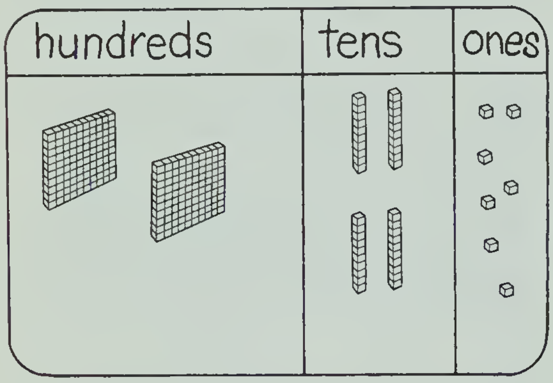
Materials

- for each child
  - place-value mat
  - place-value material
  - newspaper, catalogue or other printed material

Lesson

1

Seat the children around the working area. Place a quantity of place-value material in the centre and distribute place-value mats. Represent a three-digit number on a mat.



Ask,

How many hundreds, tens and ones are there?

Record on the easel

2 hundreds 4 tens and 7

Ask,

What number does this mean?

Record

247

Have the children represent 247 on their place-value mats. Repeat the activity, having children represent several three-digit numbers, including numbers with zero tens or zero ones: 309, 620.

2

Write a three-digit numeral on the easel. Have the children represent the number with place-value material on place-value mats. Have several numbers demonstrated, including some that involve zeros, such as 508 and 650.

3

Provide the children with real-life examples of three-digit numbers by having them consider numbers of things such as

- children in the school
- dollars to buy a 10-speed bicycle
- cents to mail 10 letters
- pages in a book
- centimetres in the width of a room
- fingers of 99 people

Invite the children to suggest other examples.

Written and Other Activities

☐

mathways 3, page 112

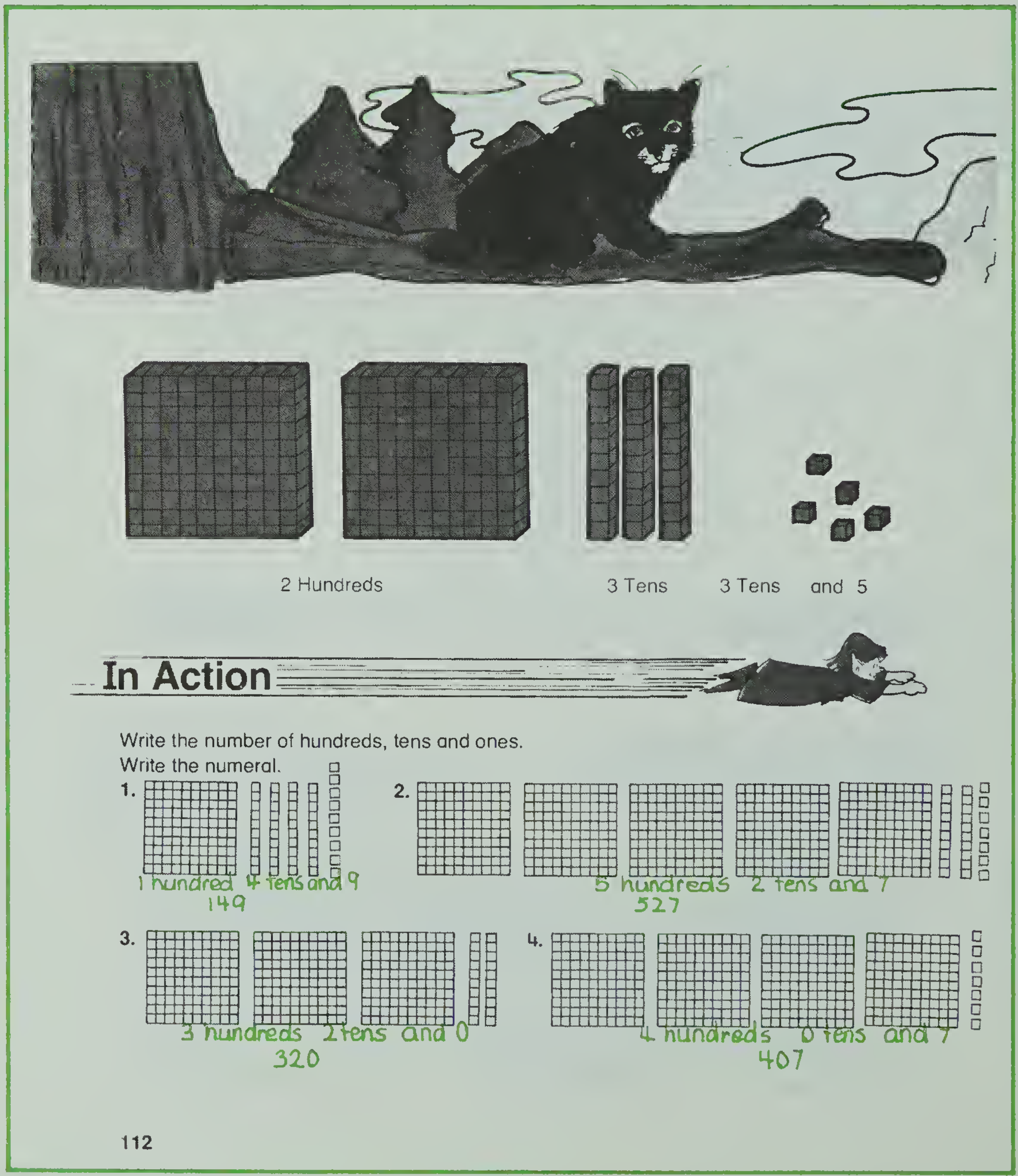
Before assigning the In Action exercises, discuss the way in which the numbers in the illustration have been represented.

☐ ☐

Ask the children to find examples of three-digit numbers in printed materials. Other text materials, newspapers and catalogues are possible sources. Give each child who finds examples an opportunity to read the examples aloud.

☐ ☐ ☐

Ask each child to discuss with adults at home how three-digit numbers are involved in their lives.



2 Hundreds

3 Tens

3 Tens and 5

In Action

Write the number of hundreds, tens and ones.
Write the numeral.

1. 1 hundred 4 tens and 9
149

2. 5 hundreds 2 tens and 7
527

3. 3 hundreds 2 tens and 0
320

4. 4 hundreds 0 tens and 7
407

112

Unit 2 Section 4 Lesson 3

Exploring Place Value: Expanded Numerals

Materials

- for each child
  - – place-value mat
  - – place-value material

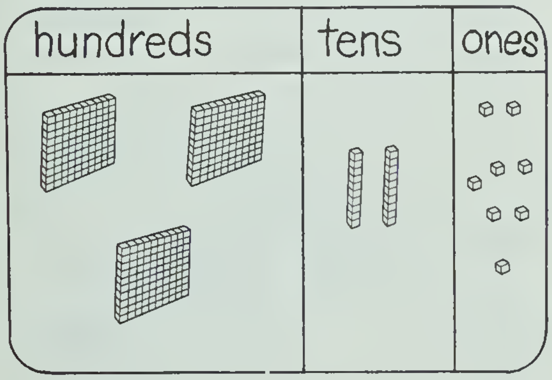
Rationale

Work with expanded numerals emphasizes the value of each digit in a numeral.

Lesson

1

Gather the children around the easel. Show a three-digit number with place-value materials on a place-value mat.



Ask,

How many hundreds, tens and ones are shown?

Record on the easel

3 hundreds 2 tens and 8

Ask a child to say the number and record the numeral on the easel.

328

Show the expanded form.

300 + 20 + 8

Have each child represent the number on a place-value mat. Repeat the activity many times, emphasizing the expanded numeral each time. Include numerals such as the following:

603 150 200
600 + 3 100 + 50 200

2

Write an expanded numeral on the easel. Have the children represent the number on place-value mats. Have one child write the number meaning on the easel and another the numeral. Repeat several times. Include numerals having zero ones, zero tens, zero tens and ones.

3

Have a child write an expanded numeral on the easel. Have the other children represent the number on their place-value mats. Ask a child to say the number and write the numeral on the easel. Repeat, calling on a different child each time.

4

Have a child show a number on a place-value mat and another say the number meaning. All the children represent the number on their place-value mats. One child writes the numeral on the easel. Another child writes the expanded form.

Written and Other Activities

☐

mathways 3, page 113

☐ ☐

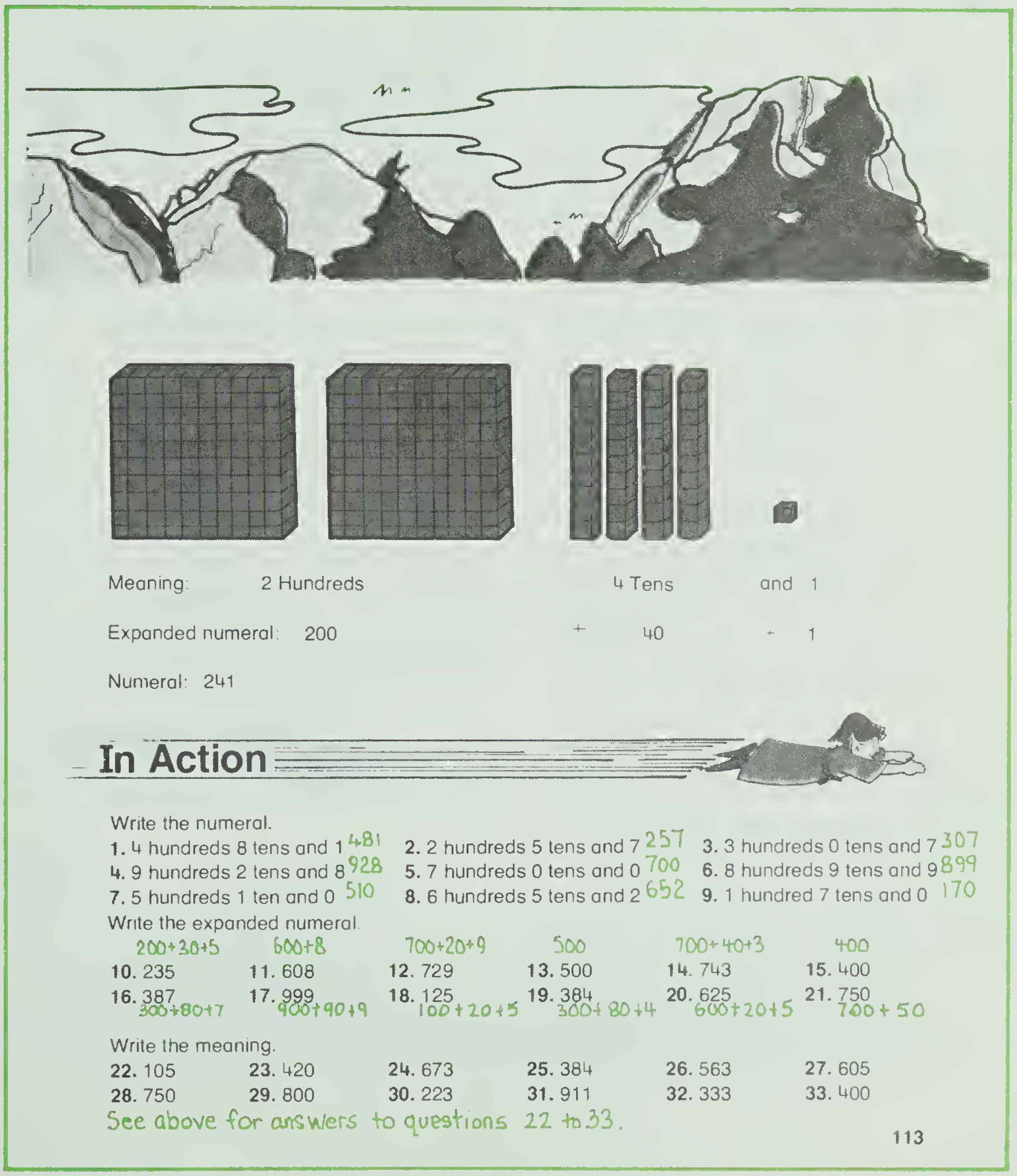
mathways 3 Practice Masters page 21

☐ ☐ ☐

mathways 3 Plus Workbook page 29

Additional Answers

22. 1 hundred 0 tens and 5
23. 4 hundreds 2 tens and 0
24. 6 hundreds 7 tens and 3
25. 3 hundreds 8 tens and 4
26. 5 hundreds 6 tens and 3
27. 6 hundreds 0 tens and 5
28. 7 hundreds 5 tens and 0
29. 8 hundreds 0 tens and 0
30. 2 hundreds 2 tens and 3
31. 9 hundreds 1 ten and 1
32. 3 hundreds 3 tens and 3
33. 4 hundreds 0 tens and 0



Meaning: 2 Hundreds 4 Tens and 1
Expanded numeral: 200 + 40 + 1
Numeral: 241

In Action

Write the numeral.

1. 4 hundreds 8 tens and 1 481
2. 2 hundreds 5 tens and 7 257
3. 3 hundreds 0 tens and 7 307
4. 9 hundreds 2 tens and 8 928
5. 7 hundreds 0 tens and 0 700
6. 8 hundreds 9 tens and 9 899
7. 5 hundreds 1 ten and 0 510
8. 6 hundreds 5 tens and 2 652
9. 1 hundred 7 tens and 0 170

Write the expanded numeral.

10. 235 200+30+5
11. 608 600+8
12. 729 700+20+9
13. 500 500
14. 743 700+40+3
15. 400 400
16. 387 300+80+7
17. 999 900+90+9
18. 125 100+20+5
19. 384 300+80+4
20. 625 600+20+5
21. 750 700+50

Write the meaning.

22. 105
23. 420
24. 673
25. 384
26. 563
27. 605
28. 750
29. 800
30. 223
31. 911
32. 333
33. 400

See above for answers to questions 22 to 33.

113

Unit 2 Section 4 Lesson 4

Ordering Numbers: Counting Forward and Backward

Materials

- counting instruction cards, one set for each group of three
- Program Master 21, 10 copies
- for each child
  - Program Master 21, two copies

Rationale

Counting forward and backward and stating the number before, after and between prepares children for comparing two numbers and for ordering numbers from least to greatest and greatest to least.

Lesson

1

Gather the children into the working area. Have them count in unison starting at a given number. For example

Start counting at 35. Count forward to 45.

Start at 98 and count backward to 88.

Repeat until the children have counted forward and back from several two-digit numbers.

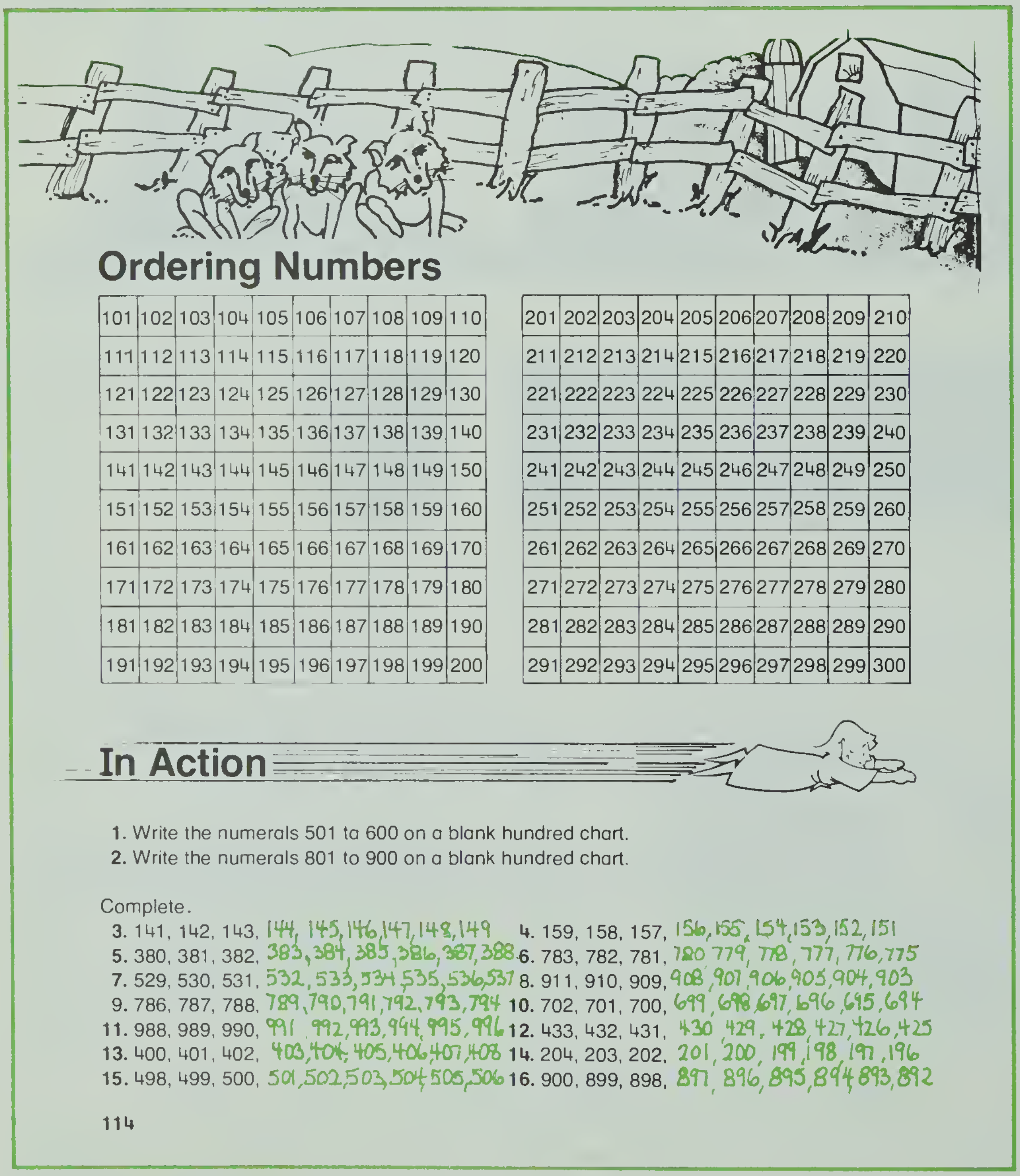
2

Select a child to count aloud from 51 to 61. Have the group count from 151 to 161, from 251 to 261, from 951 to 961. Discuss the pattern in counting. Repeat.

3

Using the above procedure, have the children count a decade of two-digit numbers backward, then the parallel decade of three-digit numbers:

Count back from 37 to 27, from 137 to 127, from 237 to 227.



Ordering Numbers

101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300

In Action

1. Write the numerals 501 to 600 on a blank hundred chart.
2. Write the numerals 801 to 900 on a blank hundred chart.

Complete.

3. 141, 142, 143, 144, 145, 146, 147, 148, 149
4. 159, 158, 157, 156, 155, 154, 153, 152, 151
5. 380, 381, 382, 383, 384, 385, 386, 387, 388
6. 783, 782, 781, 780 779, 778, 777, 776, 775
7. 529, 530, 531, 532, 533, 534, 535, 536, 537
8. 911, 910, 909, 908, 907, 906, 905, 904, 903
9. 786, 787, 788, 789, 790, 791, 792, 793, 794
10. 702, 701, 700, 699, 698, 697, 696, 695, 694
11. 988, 989, 990, 991 992, 993, 994, 995, 996
12. 433, 432, 431, 430 429, 428, 427, 426, 425
13. 400, 401, 402, 403, 404, 405, 406, 407, 408
14. 204, 203, 202, 201, 200, 199, 198, 197, 196
15. 498, 499, 500, 501, 502, 503, 504, 505, 506
16. 900, 899, 898, 897, 896, 895, 894 893, 892

114

4

Make a 1000-chart by joining ten 100-charts. Assign each child a numerical sequence to fill in on the chart by posting a list such as the following:

Name	Numerals to Write
Inez	1 - 33
Peter	34 - 67
⋮	⋮
Doris	967 -1000

5

Have small groups of children sit in circles on the floor. Give a counting instruction, for example,

Start at 437 and count forward.

Each child in a group counts one number in the sequence:

First child: 437

Second child: 438

Third child: 439

Interrupt the counting with another instruction. Continue the activity while interest remains high.

Written and Other Activities

☐

mathways 3, page 114

Before assigning the page, give each child two blank 100-charts (Program Master 21), needed for completing exercises 1 and 2.

☐ ☐

Prepare counting instruction cards. For example, count from 305 to 317, or count from 773 to 742. Provide each group of three children with a set. Each group member chooses a card and counts aloud forward or back as instructed while the others count or, as a variation, write the numerals.

☐ ☐ ☐

Have the children colour various numerical sequences in different colours on their 100-charts. For example,

Colour 503 to 511 red.

Colour 586 to 573 green.

Unit 2 Section 4 Lesson 5

Ordering Numbers: Numbers Before, After and Between

Materials

- cubes, *see* ☐ ☐

Lesson

1

Invite the children into the working area. Seat them in a circle on the floor. Ask questions like

What is the number after 54? 154? 254? 454? 954?

Have the children work with numbers that have zeros in the tens digit:

What is the number after 7? 107? 207? 407? 807?

Require change in the tens digit by having the children work with nines:

What is the number after 39? 359? 769? 969?

Extend the principle to the hundreds digit:

What is the number after 199? 299? 599? 899?

2

Have the children count back:

What is the number before 22? 222? 322? 522? 822?

Repeat, substituting numbers that require a change in the tens digit:

What is the number before 70? 170? 270? 570? 970?

Extend the principle to the hundreds digit:

What is the number before 200? 300? 400? 500? 900?

3

Have the children work with numbers between:

What is the number between 73 and 75? 373 and 375? 573 and 575? 873 and 875?

Repeat, substituting a sequence showing the pattern of change in the tens digit:

What is the number between 28 and 30? 228 and 230?

Extend the principle to the hundreds digit:

What is the number between 99 and 101? 499 and 501? 699 and 701? 899 and 901?

4

Have the children write the answers to a random sequence of questions:

What is the number before 715? After 502? Between 397 and 399?

5

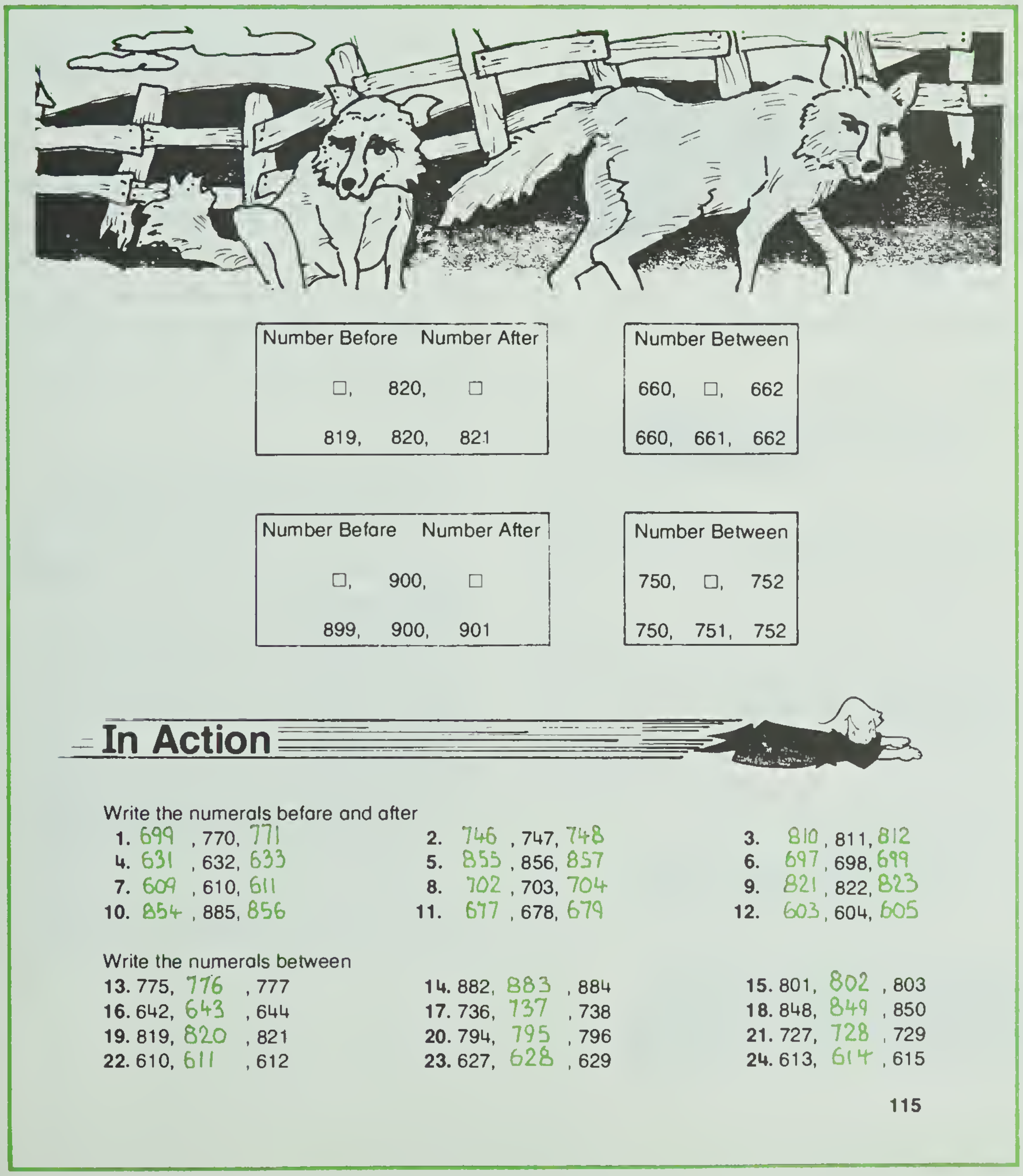
Extend the principle to include numbers that do not come immediately before, after or between given numbers:

Is 436 between 417 and 438?

Is 319 before 301?

Is 981 before or after 971?

Have the children form groups and continue the activity until each group member has had an opportunity to ask at least one question.



Number Before Number After
☐, 820, ☐
819, 820, 821

Number Between
660, ☐, 662
660, 661, 662

Number Before Number After
☐, 900, ☐
899, 900, 901

Number Between
750, ☐, 752
750, 751, 752

In Action

Write the numerals before and after

1. 699 , 770, 771
2. 746 , 747, 748
3. 810 , 811, 812
4. 631 , 632, 633
5. 855 , 856, 857
6. 697 , 698, 699
7. 609 , 610, 611
8. 702 , 703, 704
9. 821 , 822, 823
10. 854 , 885, 856
11. 677 , 678, 679
12. 603 , 604, 605

Write the numerals between

13. 775, 776 , 777
14. 882, 883 , 884
15. 801, 802 , 803
16. 642, 643 , 644
17. 736, 737 , 738
18. 848, 849 , 850
19. 819, 820 , 821
20. 794, 795 , 796
21. 727, 728 , 729
22. 610, 611 , 612
23. 627, 628 , 629
24. 613, 614 , 615

115

Written and Other Activities

☐

mathways 3, page 115

Before assigning the page, have children give the missing numbers in the examples.

☐ ☐

Use three cubes, each a different colour. Mark each face with a numeral. Designate each colour to represent a place value. For example, let yellow stand for hundreds, blue for tens, red for ones. Group members take turns rolling the set of cubes. After each roll, all group members first say and write the number shown on the upturned faces, then write the numbers that come immediately before and after.

Unit 2 Section 4 Lesson 6

Exploring Number Patterns: Counting by Ones, Twos, Fours, Fives

Materials

- for each child
  - copy of Program Master 21
  - stencils, *see* ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ *and* ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Lesson

1

Gather the children around the easel. Write *204.*

Ask

What is the number that is one greater than 204?

Does 205 come before or after 204?

Write the number meanings:

2 hundreds 0 tens and 4

2 hundreds 0 tens and 5

Write *592* and ask a child for the number that is one greater than. Record

5 hundreds 9 tens and 2

5 hundreds 9 tens and 3

2

Write the following meanings:

6 hundreds 3 tens and 4

3 hundreds 5 tens and 9

9 hundreds 9 tens and 6

1 hundred 9 tens and 9

Have children write the numeral that is one greater than each meaning on the easel. Discuss the resulting pattern of change in the ones, tens and hundreds places.

3

Write *133* and ask

What is the number before 133?

Is 132 one less than 133?

Have two children write the meanings:

1 hundred 3 tens and 3

1 hundred 3 tens and 2

4

Write the following number meanings on the easel:

4 hundreds 8 tens and 4

7 hundreds 2 tens and 0

8 hundreds 0 tens and 3

3 hundreds 0 tens and 0

Have children write the numeral that is one less than each number. For each example, ask another child to explain how the ones, tens and hundreds changed.

5

Give the children instructions such as the following:

Start at 5 and count by fives.

Start at 305 and count by fives.

Repeat the procedure for counting by twos and fours.

6

Write the first three entries in a series of one- and two-digit numbers. For example

2, 4, 6, ____, ____, ____, ____

70, 75, 80, ____, ____, ____, ____

30, 28, 26, ____, ____, ____, ____

24, 28, 32, ____, ____, ____, ____

40, 35, 30, ____, ____, ____, ____

56, 52, 48, ____, ____, ____, ____

Have children continue the patterns.

7

Write entries for a series of three-digit number patterns:

152, 154, 156, ____, ____, ____

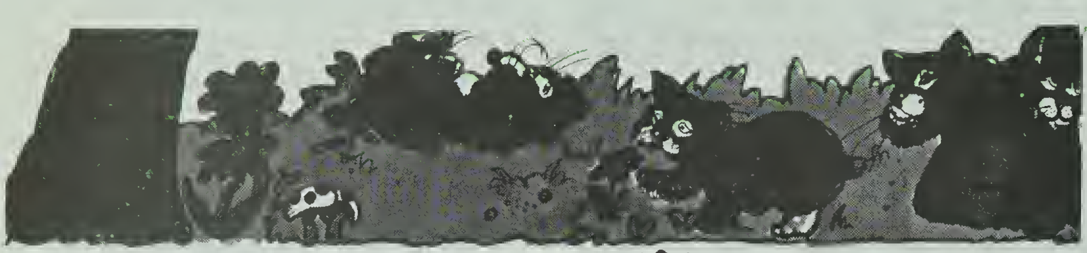
235, 240, 245, ____, ____, ____

758, 756, 754, ____, ____, ____

860, 864, 868, ____, ____, ____

995, 990, 985, ____, ____, ____

Have children continue the patterns.



324

Meaning: 3 hundreds 2 tens and 4

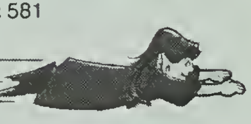
Numeral 1 *less than*: 323
Numeral 1 *greater than*: 325

580

Meaning: 5 hundreds 8 tens and 0

Numeral 1 *less than*: 579
Numeral 1 *greater than*: 581

In Action



Write the numeral 1 *less than*

1. 4 hundreds 6 tens and 1 460
2. 8 hundreds 2 tens and 7 826
3. 5 hundreds 3 tens and 4 533
4. 7 hundreds 4 tens and 1 740
5. 6 hundreds 1 ten and 5 614
6. 4 hundreds 7 tens and 2 471

Write the numeral 1 *greater than*

7. 7 hundreds 1 ten and 9 720
8. 8 hundreds 9 tens and 0 891
9. 4 hundreds 3 tens and 3 434
10. 5 hundreds 8 tens and 1 582
11. 6 hundreds 5 tens and 8 659
12. 3 hundreds 2 tens and 4 325

13. Count by twos, by fours, and by fives.
Start at 200 each time.
200, 202, 204, 206, 208, 210, 212, 214
204, 208, 212, 216, 220, 224, 228
205, 210, 215, 220, 225, 230, 235

14. Count by twos, by fours, and by fives.
Start at 350 each time.
350, 352, 354, 356, 358, 360, 362
354, 358, 362, 366, 370, 374
355. 360, 365, 370, 375, 380

Continue the patterns.

15. 642, 644, 646, 648, 650, 652, 654, 656
16. 539, 541, 543, 545, 547, 549, 551, 553
17. 260, 255, 250, 245, 240 235, 230. 225
18. 900, 895, 890, 885, 880, 875, 870, 865
19. 908. 912, 916, 920, 924, 928, 932, 936
20. 200, 204, 208, 212. 216, 220, 224, 228 -
21. 721, 718, 715, 712, 709, 706, 703, 700
22. 420, 423, 426, 429, 432, 435, 438, 441
23. 399, 396, 395, 392, 391. 388. 387, 384
24. 420, 417, 414, 411, 408, 405, 402, 399

116

Written and Other Activities

☐

mathways 3, page 116

Before assigning the page, discuss the examples at the top.

☐ ☐

Have the children draw number lines and show on them the numbers that are one greater than and one less than each of the numbers given in exercises 1 and 7, page 116.

☐ ☐ ☐

Write on the easel five pairs of consecutive numbers:

414, 415
234, 235,
•
•
•

Pointing to the first pair, ask *Which of these numbers is one greater than the other? Which is one less?* Have each of the children write down 10 pairs of consecutive numbers and, beside each pair, write the relationship between the numbers:

650 is 1 greater than 649.
649 is 1 less than 650.

Then have the children show the relationships on number lines.

☐ ☐ ☐ ☐

For enrichment, have the children record the numbers that are 10 greater than and 10 less than each of the numbers in exercises 1 and 2, page 116. Discuss the resulting patterns, pointing out how the tens digit increases or decreases by one. Explain that recording the numbers that are 100 greater than the same series of numbers would reveal a pattern in which the hundreds digit would increase by one. Ask what would happen if they recorded numbers that were 100 less than the numbers given in the exercises.

☐ ☐ ☐ ☐ ☐

Challenge the children by writing a series of numbers and asking them to write the numbers that are three greater than and less than each number.

☐ ☐ ☐ ☐ ☐ ☐

Give each child a copy of the blank Hundred Chart reproduced from Program Master 21. Have them begin at some multiple of one hundred and create a pattern by writing in every third (or fourth or fifth) numeral on the chart.

			604				608		
	612				616				620
			624				628		

☐ ☐ ☐ ☐ ☐ ☐ ☐

Ask the children to write additional entries for three-digit number patterns:

755, 760, 765, ____, ____, ____, ____
862, 860, 858, ____, ____, ____, ____
323, 326, 328, 331, 333, ____, ____, ____

Then ask the children to create several number patterns involving three-digit numbers. These patterns can be exchanged and neighbours can write additional entries.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Prepare a stencil giving instructions such as the following:

1. Draw and mark a number line showing the numbers from 609 to 622.
   Loop the number before 613.
   Underline the number after 617.
   Colour the number between 619 and 621.
2. Write the 10 numbers that come after 694.
3. Write the 10 numbers that come before 231.
4. Write all the numbers that come between 492 and 504.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Prepare a stencil such as the following:

____ ____ ____ ____ ____ ____ ____
____ ____ 670 ____ ____ ____ ____
____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ 686 ____ ____
____ ____ ____ ____ ____ ____ ____
____ ____ ____ ____ ____

Have the children fill in the missing numerals by counting forward or backward.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 22

Unit 2 Section 4 Lesson 7

Exploring Greater Than, Less Than: Comparing Numbers

Materials

- dice: one marked 0, 1, 2, 3, 4, 5
  one marked 0, 2, 4, 6, 8, 9
  one marked 4, 5, 6, 7, 8, 9
- stencil, *see* ☐ ☐ ☐

Rationale

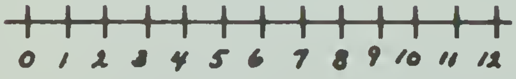
Some children may already have developed an intuitive method of comparing numbers, though they are unable to explain how they do it. Others may instinctively think of counting sequences. Still other children may be most comfortable comparing numbers on a number line, where they can see that numbers to the right of a given number are greater and numbers to the left of it are less. Most children know that numbers having more digits are greater than numbers having fewer digits. To clarify how comparisons can be made quickly between numbers with the same quantity of digits – say, 423 and 425 – encourage the children to compare single digits from left to right; when one digit in one of the numbers being compared increases, that number is greater; when one digit decreases, that number is less. Thus although 423 and 424 have the same numerals in both the hundreds and tens places, the ones digit is greater in 425, therefore *425 > 423*.

Irrespective of their present methods of comparing numbers the children will profit from many opportunities to compare numbers in several different ways.

Lesson

1

Gather the children around the easel. Draw a number line marked 0 to 12.



Then write

7 ☐ *5*

and ask which number is greater. Have a child point to both numbers on the number line. Explain that the greater number is to the right of the lesser number. Use the symbol to complete the number sentence on the easel, reminding the children that it means *greater than.*

7 $\boxed{>}$ *5*

Seven is greater than five.

Ask the children for examples of other numbers that are greater than five. Record the examples given.

2

Write on the easel

5 ☐ 7.

Ask which number is less. Have a child point to both numbers on the number line, explaining that the number to the left of another number is less. Use the symbol to complete the number sentence, remarking that it means *less than.*

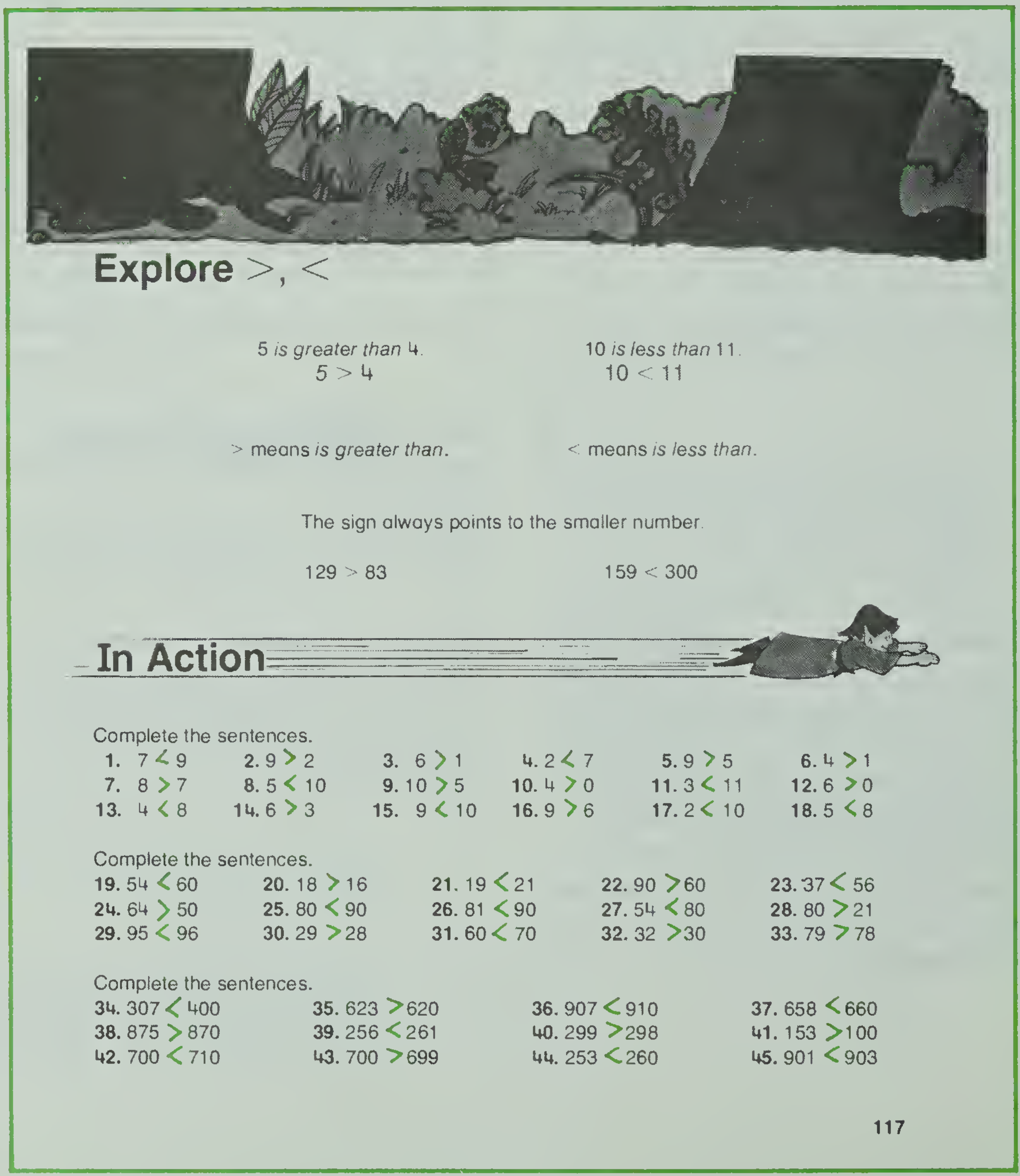
5 $\boxed{<}$ *7*

Five is less than seven.

Ask the children to give examples of other numbers that are less than seven. Record each example and point it out on the number line. Each time, emphasize that the number is to the left of the seven.

3

Invite the children to suggest ways to help remember the meaning of the symbols <, >. Some children may say that the larger side of the symbol is next to the greater number or that the symbol always points to the lesser number.



Explore >, <

5 *is greater than* 4.
5 > 4

10 *is less than* 11.
10 < 11

> means *is greater than.*

< means *is less than.*

The sign always points to the smaller number.

129 > 83

159 < 300

In Action

Complete the sentences.

1. 7 < 9   2. 9 > 2   3. 6 > 1   4. 2 < 7   5. 9 > 5   6. 4 > 1
7. 8 > 7   8. 5 < 10   9. 10 > 5   10. 4 > 0   11. 3 < 11   12. 6 > 0
13. 4 < 8   14. 6 > 3   15. 9 < 10   16. 9 > 6   17. 2 < 10   18. 5 < 8

Complete the sentences.

19. 54 < 60   20. 18 > 16   21. 19 < 21   22. 90 > 60   23. 37 < 56
24. 64 > 50   25. 80 < 90   26. 81 < 90   27. 54 < 80   28. 80 > 21
29. 95 < 96   30. 29 > 28   31. 60 < 70   32. 32 > 30   33. 79 > 78

Complete the sentences.

34. 307 < 400   35. 623 > 620   36. 907 < 910   37. 658 < 660
38. 875 > 870   39. 256 < 261   40. 299 > 298   41. 153 > 100
42. 700 < 710   43. 700 > 699   44. 253 < 260   45. 901 < 903

117

4

Write on the easel

63 □ 72.

Discuss which of the two symbols should be used to complete the sentence and how we can find out. Draw a number line, marking on 62 and 72. Emphasize that 62 is to the left of 72. Ask a child if numbers to the left are *greater than* or *less than*. Have the child who responds correctly use the symbol to complete the sentence on the easel and another child count from 62 to 72 on the number line. Then ask the children to tell how many tens are in 62 and 72. Explain that since 72 has more tens, it is greater than 62.

5

Write the following number sentences on the easel:

37 □ 31
48 □ 98
70 □ 80
128 □ 19
734 □ 534
648 □ 698
537 □ 536

Select children to tell which number is *greater than* or *less than* in each sentence, and to explain their method of comparing numbers and how they remember the correct symbol to use.

Written and Other Activities

□

mathways 3, page 117

□ □

Have groups of three to five children play a dice game. Using the specially marked dice, each player tries to throw a number that is *greater than* the number thrown by the other players and records the numerals shown on the upturned faces of the dice. Successful players score one point. The player who has the greatest number of points after 15 throws is the winner. Vary the game so that players who record numbers that are *less than* the numbers thrown by the other players score a point.

□ □ □

Prepare a stencil such as the following:

$76 > \square 6$
$4\square < 4\square$
$2\square 3 < \square\square 3$
$\square 35 < 1\square\square$

Have the children fill in each square with a digit that will make the number sentence true.

□ □ □ □

Have pairs of children ask each other *greater than, less than* questions:

Is 734 greater than or less than 743?

□ □ □ □ □

Have the group divided into two teams in some convenient manner. Each team appoints a recorder who stands at the blackboard. Have each recorder write and conceal a three-digit numeral on the blackboard. The game begins this way. The first member of team 1 makes a statement (by guessing) such as the following about the two hidden numbers:

Larry's number is less than Patricia's.

The two recorders then reveal the numbers and an assessment is made as to whether the statement is correct. If it is, team 1 wins a point; if not, team 2 wins the point. The two recorders then erase, and record and hide new three-digit numerals and the first member of team 2 makes a statement about them. The game proceeds in this fashion until each member of each team has had an opportunity to make a guess about the hidden numbers. The scores are then totalled and the winning team declared.

For Your Notes

Unit 2 Section 4 Lesson 8

Ordering Three-Digit Numbers: Least to Greatest, Greatest to Least

Materials

- deck of 32 cards:
  - 10 marked 100
  - 10 marked 10
  - 10 marked 1
  - two marked STOP!
- for each group
  - coloured cards: nine red, nine green, 10 yellow

Lesson

1

Gather the children around the easel. Write 5 two-digit numerals in random order. Ask

Which of these numbers is least?

Ask children who respond correctly to explain their methods of finding the number that is least. Have a child write the numeral on the far left side of the easel. Ask the children which of the remaining four numbers is least. Have a child who responds correctly record the numeral in the appropriate location on the easel.

Continue the procedure until all five numbers are ordered.

Say,

These five numbers are now in order from least to greatest.

2

Have a child read the numbers aloud from least to greatest. Have another child read the numbers from greatest to least as you point to each numeral. Ask children if they agree that saying the numbers from greatest to least is the opposite of saying them from least to greatest.

3

Write five randomly ordered three-digit numerals and ask

Which of these numbers is greatest?

Have a child record the correct numeral on a new line on the far left side of the easel. Ask

Which of the remaining four numbers is greatest?

Have the numeral recorded in the appropriate location. Repeat until all the numbers have been ordered. Say

These numbers are in order from greatest to least.

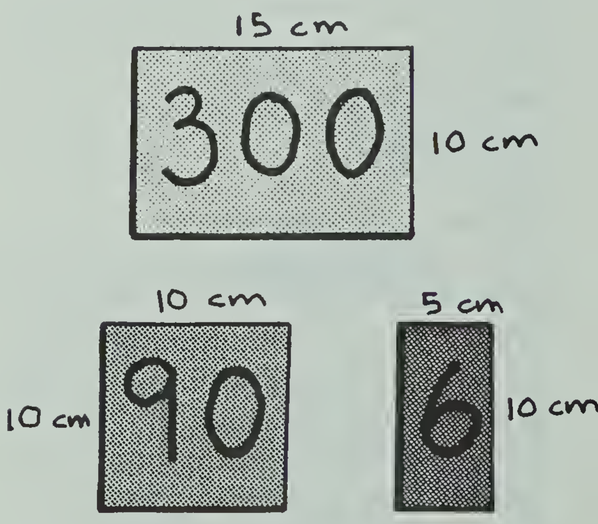
Have a child read the numbers, from greatest to least, aloud. Have another child read the numbers from least to greatest. Ask

Do you agree that saying numbers from least to greatest is the opposite of saying them from greatest to least, Mary? Can you show us why?

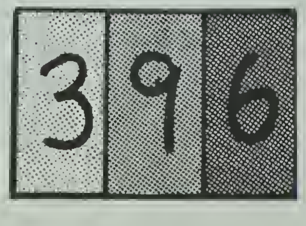
Repeat, using other groups of three-digit numbers.

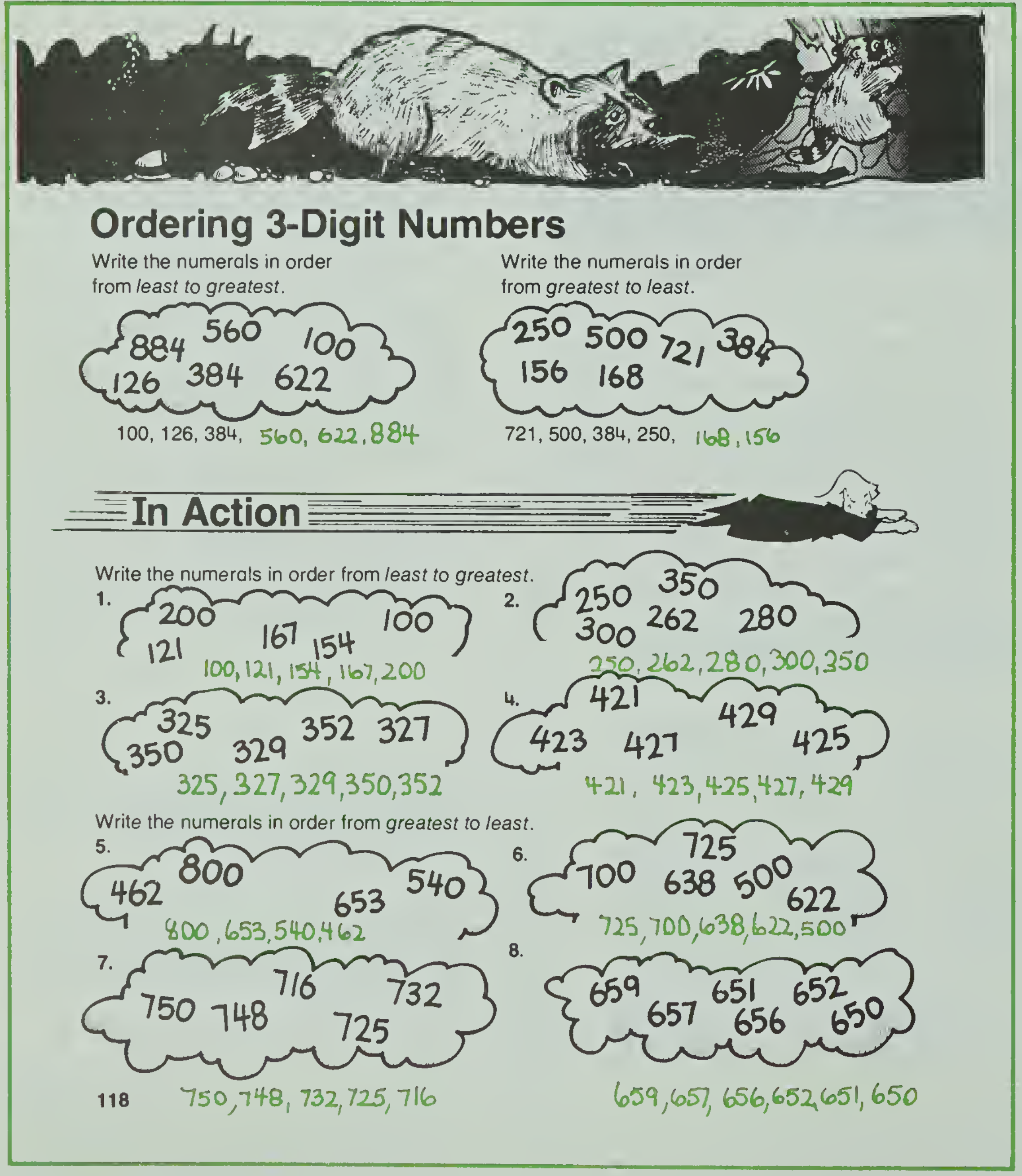
4

Have each group of children prepare three sets of cards: a set of red cards marked 100 to 900; a set of green cards marked 10 to 90; a set of yellow cards marked 0 to 9.



If the numerals are positioned carefully, the cards will stack.





Ordering 3-Digit Numbers

Write the numerals in order from *least to greatest.*

884 560 100 126 384 622

100, 126, 384, 560, 622, 884

Write the numerals in order from *greatest to least.*

250 500 721 384 156 168

721, 500, 384, 250, 168, 156

In Action

Write the numerals in order from *least to greatest.*

1. 200 100 121 167 154
   100, 121, 154, 167, 200
2. 250 350 300 262 280
   250, 262, 280, 300, 350
3. 325 350 329 352 327
   325, 327, 329, 350, 352
4. 421 423 427 429 425
   421, 423, 425, 427, 429

Write the numerals in order from *greatest to least.*

5. 462 800 653 540
   800, 653, 540, 462
6. 725 700 638 500 622
   725, 700, 638, 622, 500
7. 750 748 716 732 725
   750, 748, 732, 725, 716
8. 659 657 651 656 652 650
   659, 657, 656, 652, 651, 650

118

Have each set of cards shuffled and placed face down in the centre of each playing area. Taking turns, players draw one card from each deck. When all the players have drawn three cards, they stack them to show the numbers. The player who has drawn the greatest number scores a point. The cards are then returned to the correct sets and shuffled for another turn. The player with the greatest number of points at the end of 10 rounds is the winner. Vary the game by having the player with the card that shows the number that is least score a point.

Written and Other Activities

☐

mathways 3, page 118

Before assigning the page, select children to explain and complete the examples.

☐ ☐

Place the deck of 32 specially marked cards face down in the centre of the playing area. Four players, in turn, draw one card from the deck. The first player who draws a STOP! card calls *Stop*. Each player determines what number is represented by the cards he or she has drawn and writes the numeral on a sheet of paper. The player whose number is greatest scores one point. The winner is the player with the greatest score after a predetermined number of rounds. Vary the game by having players with the number that is least score a point.

☐ ☐ ☐

Have each child write on a sheet of paper any three numerals from 0 to 9. Have the children use the numerals to write as many three-digit numerals as possible without repeating digits. Show an example, using 1, 2, 3:
123, 132, 231, 213, 312, 321

Have the children order the numbers they have formed from least to greatest and then from greatest to least. For a greater challenge allow interested children to repeat digits. Show an example:
111, 112, 113, 121, 122, 123,
131, 132, 133.
211, 212, 213, 221, 222, 223,
231, 232, 233,
311, 312, 313, 321, 322, 323,
331, 332, 333.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 23

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 30 and 31

For Your Notes

Unit 2 Section 4 Lesson 9

Byway: Sprouts

Materials

- overhead projector and transparency

Lesson

1

Gather the children around the easel. Read the rules on the children's text page. Have a pair of children demonstrate the game at the easel while the remaining group members watch. Have the children check to make sure that the rules are being followed correctly.

Written and Other Activities

☐

mathways 3, page 119

Allow the children to play the game several times with different partners to help them develop a game strategy.

☐ ☐

The game in this Byway is commonly known as Sprouts. The children who seem to be enjoying the game may be interested in organizing a Sprouts Tournament. After each child has had an opportunity to play several games, play-offs could begin. The children could be paired, with winners from each pair being paired again until a Sprouts Grand Champion is declared. Competition might then move to include neighbouring classrooms.

☐ ☐ ☐

Invite two competent players who do not mind pressure situations to display their skill by playing a game of Sprouts on a transparency on the overhead projector. The whole class will enjoy watching this matching of wits.

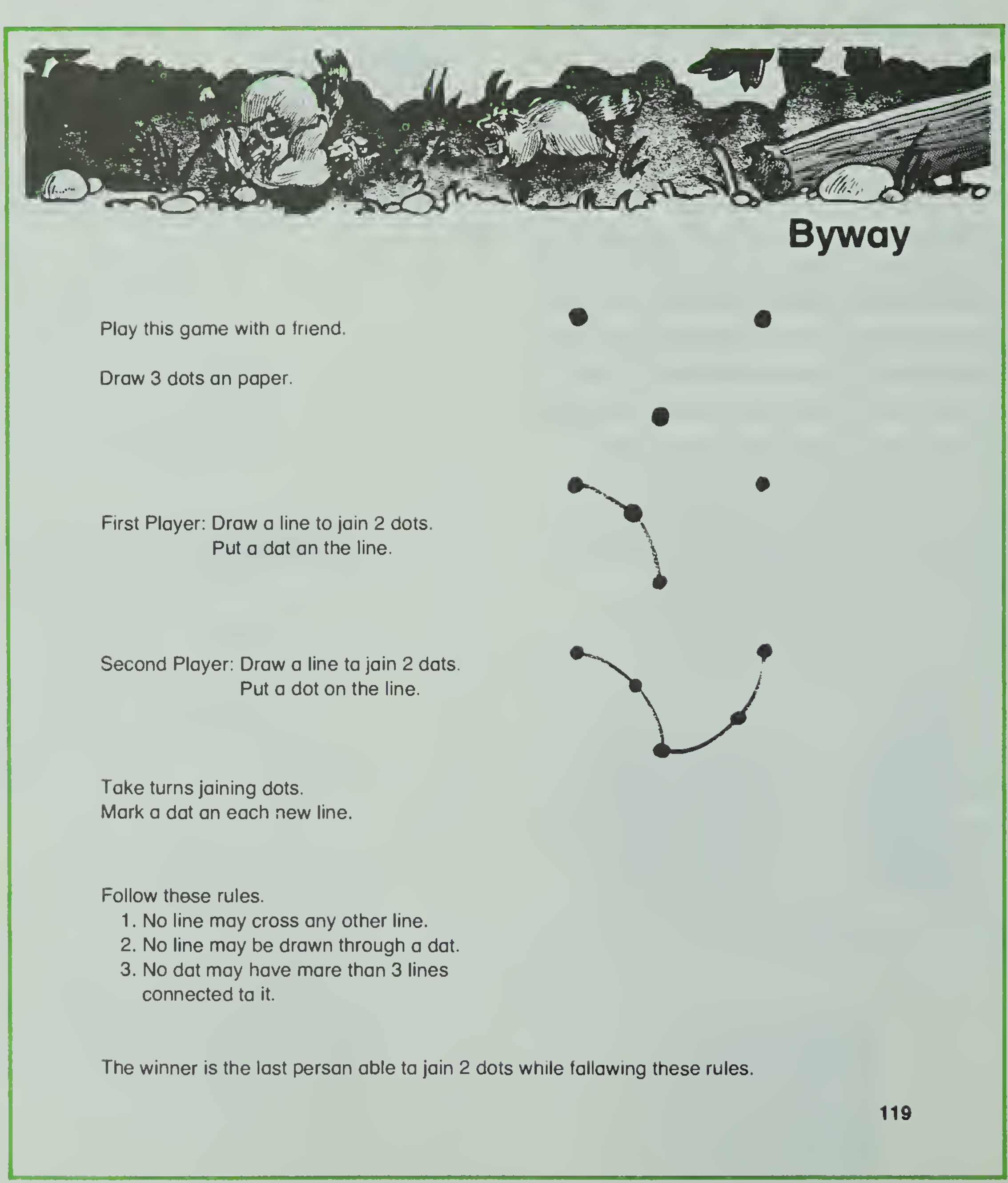
☐ ☐ ☐ ☐

In art have the children each design a Sprouts Badge. Have the class view all of the designs and select the one to be awarded to the Sprouts Grand Champion.

☐ ☐ ☐ ☐ ☐

Make the game more complicated by instructing children to increase the number of starting dots to four or five.

For Your Notes



Byway

Play this game with a friend.

Draw 3 dots on paper.

First Player: Draw a line to join 2 dots.
Put a dot on the line.

Second Player: Draw a line to join 2 dots.
Put a dot on the line.

Take turns joining dots.
Mark a dot on each new line.

Follow these rules.
1. No line may cross any other line.
2. No line may be drawn through a dot.
3. No dot may have more than 3 lines connected to it.

The winner is the last person able to join 2 dots while following these rules.

119

Unit 2 Section 5 Lesson 1

Adding a Two-Digit and a One-Digit Number

Materials

- for each child
  - place-value materials: Program Masters 19 and 20
  - place-value mat: Program Master 16

Rationale

Section 5 prepares children to add with regrouping. To ensure that children will understand the concepts, it is important that the initial presentation of each stage involve place-value materials as well as – and along side of – the abstract form of the algorithm. In this way, children will see the relation between the concrete act of combining objects and the algorithm.

Lesson

1

Gather the children around the easel. Write

51
+ 7

Provide the children with place-value material and mats and have them show the first addend, then the second addend.

Have the children combine and count the material in the ones column. Record the sum on the easel.
Have the children count the material in the tens column. Record the sum.

51
+ 7
58

Repeat the procedure, using several more two-digit and one-digit addition questions that do not involve regrouping.

2

Write on the easel

65
+ 2

Have the children find the sum without using place-value materials.
Emphasize that the sum of the ones column is written first, the sum of the tens column next. Repeat several times.

3

On the easel draw a place-value chart and, beside it, record an addition question.

	tens	ones
	3	6
+		2
	3	8

36
+ 2

Have another child come forward and fill in the sum under the addition question.

4

Conduct a discussion in which each child in a group is invited to suggest one way of representing an addition question such as
26 + 2 = 28.

Invite the children to demonstrate their methods on the easel if they wish.

Written and Other Activities

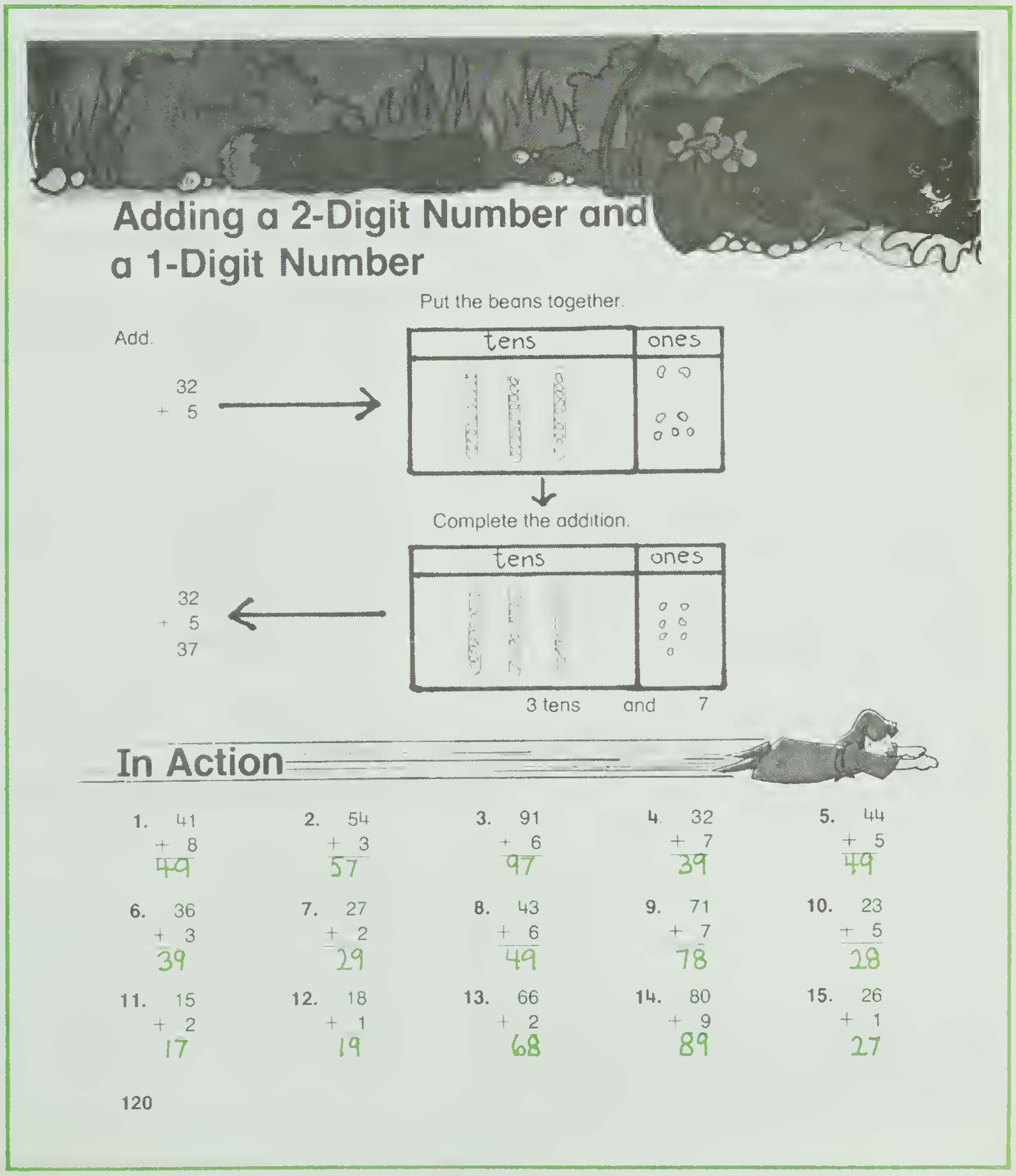
☐

mathways 3, page 120

Before assigning the page, discuss the examples. Invite two children to use the easel and place-value material on place-value mats to reproduce each sample question, one child writing it on the easel, the other demonstrating on the mat. Discuss that these are two ways of representing the same addition question.

☐ ☐

mathways 3 Practice Masters page 24



Adding a 2-Digit Number and a 1-Digit Number

Put the beans together.

Add.

32
+ 5

Complete the addition.

32
+ 5
37

3 tens and 7

In Action

1. 41 + 8 49	2. 54 + 3 57	3. 91 + 6 97	4. 32 + 7 39	5. 44 + 5 49
6. 36 + 3 39	7. 27 + 2 29	8. 43 + 6 49	9. 71 + 7 78	10. 23 + 5 28
11. 15 + 2 17	12. 18 + 1 19	13. 66 + 2 68	14. 80 + 9 89	15. 26 + 1 27

120

Unit 2 Section 5 Lesson 2

Exchanging Tens for Ones

Materials

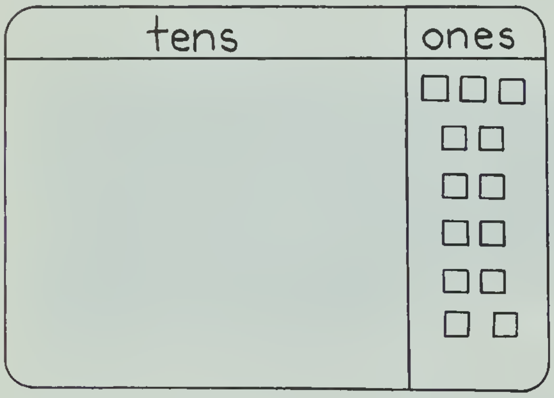
- for each child
  - place-value material
  - place-value mat
  - base 10 material
- for each group
  - deck of *Concentration* cards, *see* ☐ ☐

Lesson

1

Seat the children around the working area. Put the place-value and base 10 material in the centre and distribute place-value mats. Say

Count out 13 ones and place them in the correct column of your place-value mats.

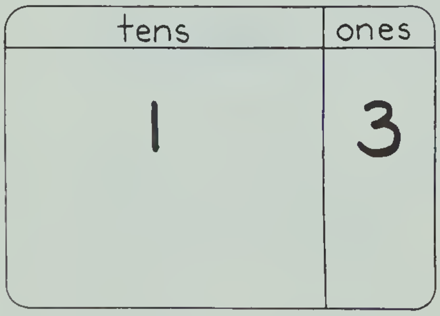


When the task has been completed, ask

Will each of you give me 10 of your ones if I give you 1 of my tens in return?

Explain that since 1 ten and 10 ones are equal in value, whenever there are more than 9 ones to add to a number of tens, just such an exchange takes place. Then write on the easel

13 ones

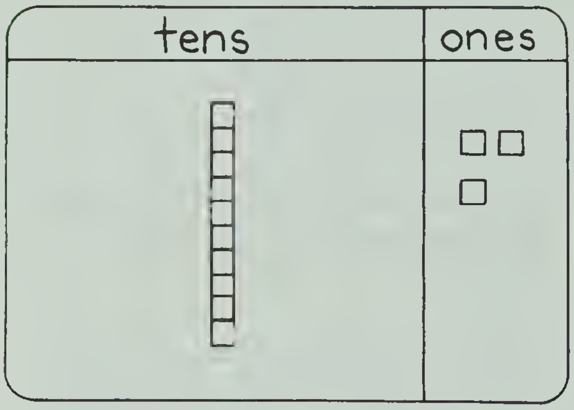


Have a child write the number of tens and ones in the appropriate columns.

Then, drawing from the central pile, give each child a 10-strip and ask for 10 ones in return. On the easel write

1 ten and 3

13



2

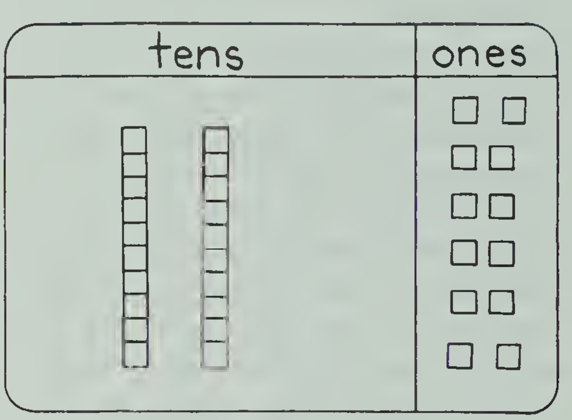
Say

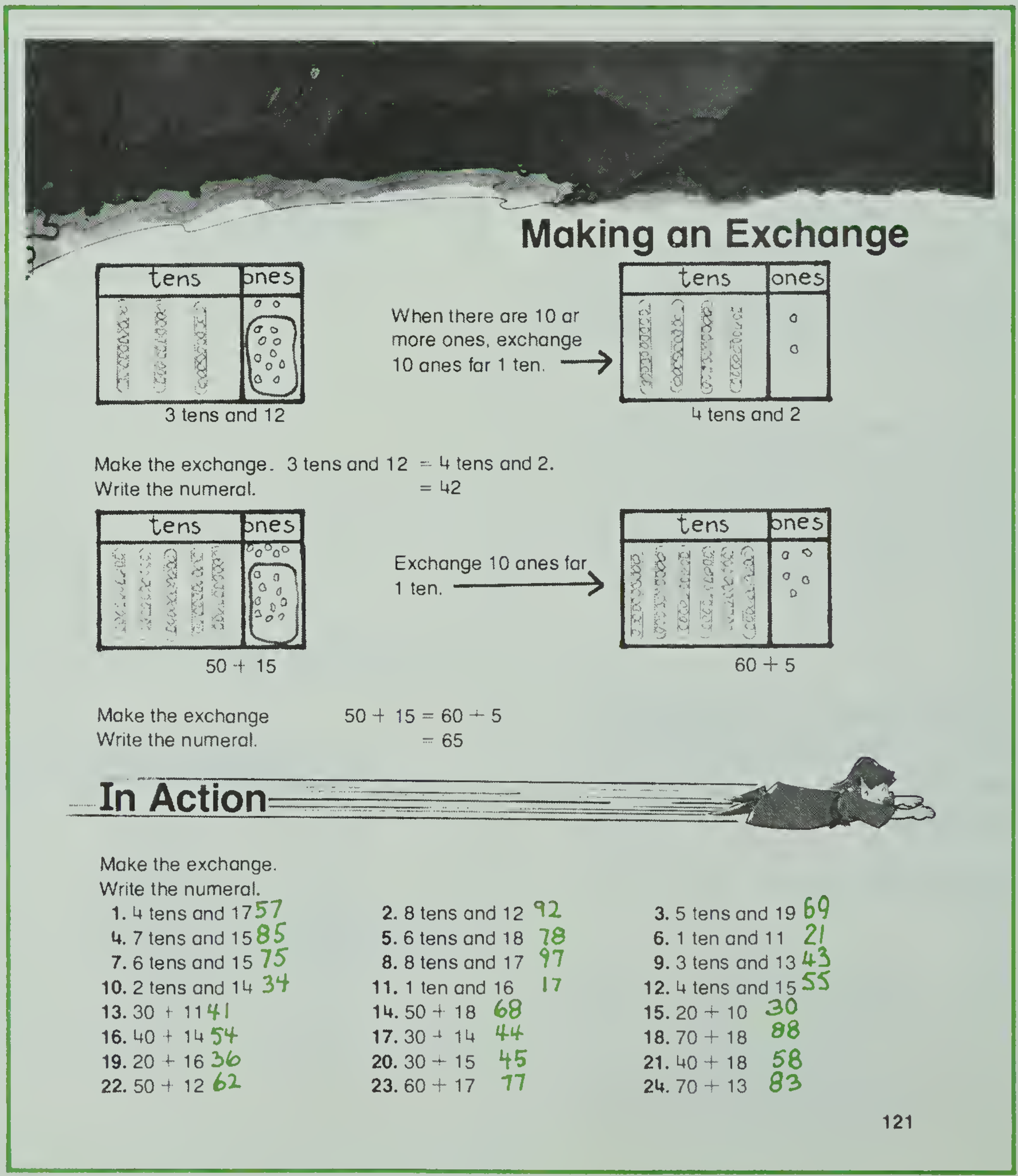
Place 2 tens and 12 ones on your place-value mats.

Record on the easel

2 tens and 12

20 + 12





Making an Exchange

3 tens and 12

When there are 10 or more ones, exchange 10 ones for 1 ten.

4 tens and 2

Make the exchange. 3 tens and 12 = 4 tens and 2.
Write the numeral. = 42

50 + 15

Exchange 10 ones for 1 ten.

60 + 5

Make the exchange 50 + 15 = 60 + 5
Write the numeral. = 65

In Action

Make the exchange.
Write the numeral.

1. 4 tens and 17 57
2. 8 tens and 12 92
3. 5 tens and 19 69
4. 7 tens and 15 85
5. 6 tens and 18 78
6. 1 ten and 11 21
7. 6 tens and 15 75
8. 8 tens and 17 97
9. 3 tens and 13 43
10. 2 tens and 14 34
11. 1 ten and 16 17
12. 4 tens and 15 55
13. 30 + 11 41
14. 50 + 18 68
15. 20 + 10 30
16. 40 + 14 54
17. 30 + 14 44
18. 70 + 18 88
19. 20 + 16 36
20. 30 + 15 45
21. 40 + 18 58
22. 50 + 12 62
23. 60 + 17 77
24. 70 + 13 83

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Ask

If you want to write the numeral that represents the same value as 2 tens and 12, what must you do?

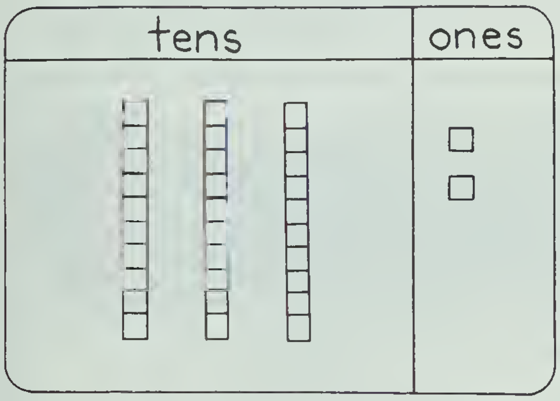
A child responds

Exchange 1 ten for 10 ones.

Have the children deposit their ones on the central pile and take tens in exchange. Instruct the children to arrange the material on their mats. Then have a child come forward and fill in the number of tens and ones in the appropriate columns on the easel.

Write

3 tens and 2
30 + 2
32



Repeat, using several examples including one in which zero ones are left in the ones column, such as

4 tens and 10

Have children do the recording on the easel.

3

Write on the easel

6 tens and 15

Ask a child to show the exchange without using place-value materials by writing numerals on the easel:

6 tens and 15
7 tens and 5
75

Repeat, using several examples, including this type: *8 tens and 10.*

4

Write on the easel

30 + 17

Have all the children show the exchange on a sheet of paper, without using place-value materials to help them. The ease with which children do this task will indicate their readiness to proceed without using concrete materials and help determine how much additional work is necessary.

Written and Other Activities

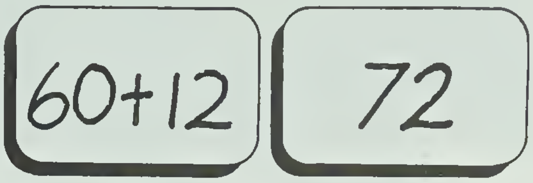
☐

mathways 3, page 121

Before assigning the In Action exercises, elicit the children's participation in explaining the examples given at the top of the page.

☐ ☐

Have groups of children play *Concentration* with cards such as these:



If necessary, refer to the directions given on page 37 of this manual.

For Your Notes

Unit 2 Section 5 Lesson 3

Adding a Two-Digit and a One-Digit Number: Exchanging Ones for Tens

Materials

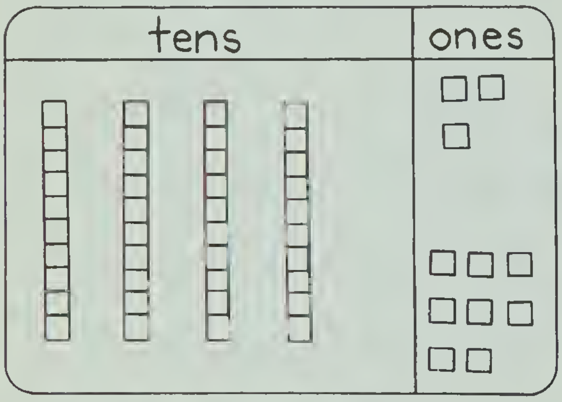
- for each child
  - place-value materials
  - place-value mat
- for each group
  - die marked 4, 5, 6, 7, 8, 9
  - base 10 material: bean sticks

Lesson

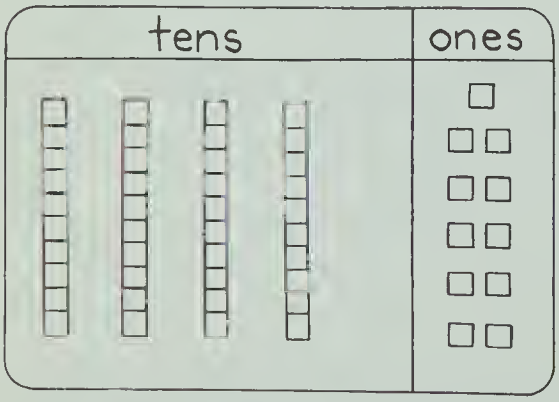
1

Seat the children around the working area. Deposit place-value materials in the centre, and distribute place-value mats. Write on the easel

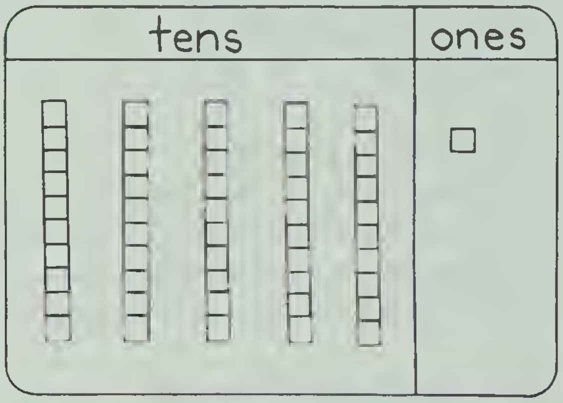
43
+ 8



Have the children show the addends on their place-value mats. Remind the children that ones are exchanged for tens only if there are more than 9 ones. Have the children combine their materials to show the addition on their place-value mats. Have them count the number of tens and the number of ones. Record on the easel
40 + 11



Ask
Since there are more than 9 ones in your ones column, what must you do?
A child responds
Exchange 10 ones for 1 ten.
Have the children deposit ones and draw tens from the central pile, and rearrange the materials on their mats.



Have a child record the sum beneath the addition question on the easel.

43
+ 8
51

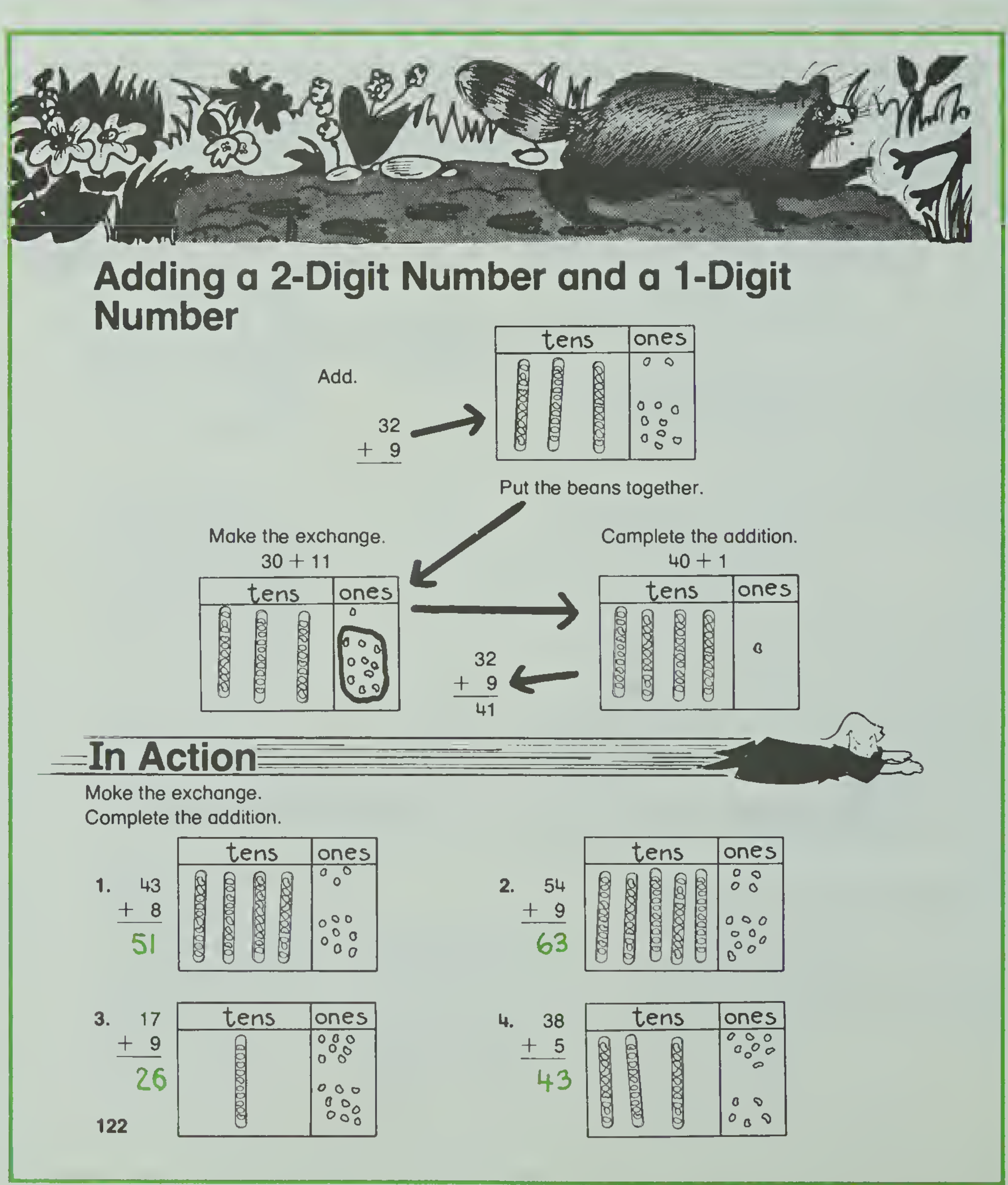
Make sure that the child enters digits from left to right. Point to the expanded numeral 40 + 11 and the sum 51, explaining that, though they are expressed differently, both represent the same number.

2

Write

78
+ 6

Ask a child
How many tens are there?
How many ones are there?
Have another child record on the easel



Adding a 2-Digit Number and a 1-Digit Number

Add.

32
+ 9

Put the beans together.

Make the exchange.
30 + 11

Complete the addition.
40 + 1

32
+ 9
41

In Action

Make the exchange.
Complete the addition.

1. 43 + 8 = 51
2. 54 + 9 = 63
3. 17 + 9 = 26
4. 38 + 5 = 43

122

7 tens and 14
Ask
What is the sum?
Have the child who answers correctly write the sum on the easel. Repeat until the children seem comfortable at doing the questions without the aid of place-value materials. Include questions in which zero ones appear in the sums, such as 52 + 8.

Written and Other Activities

☐

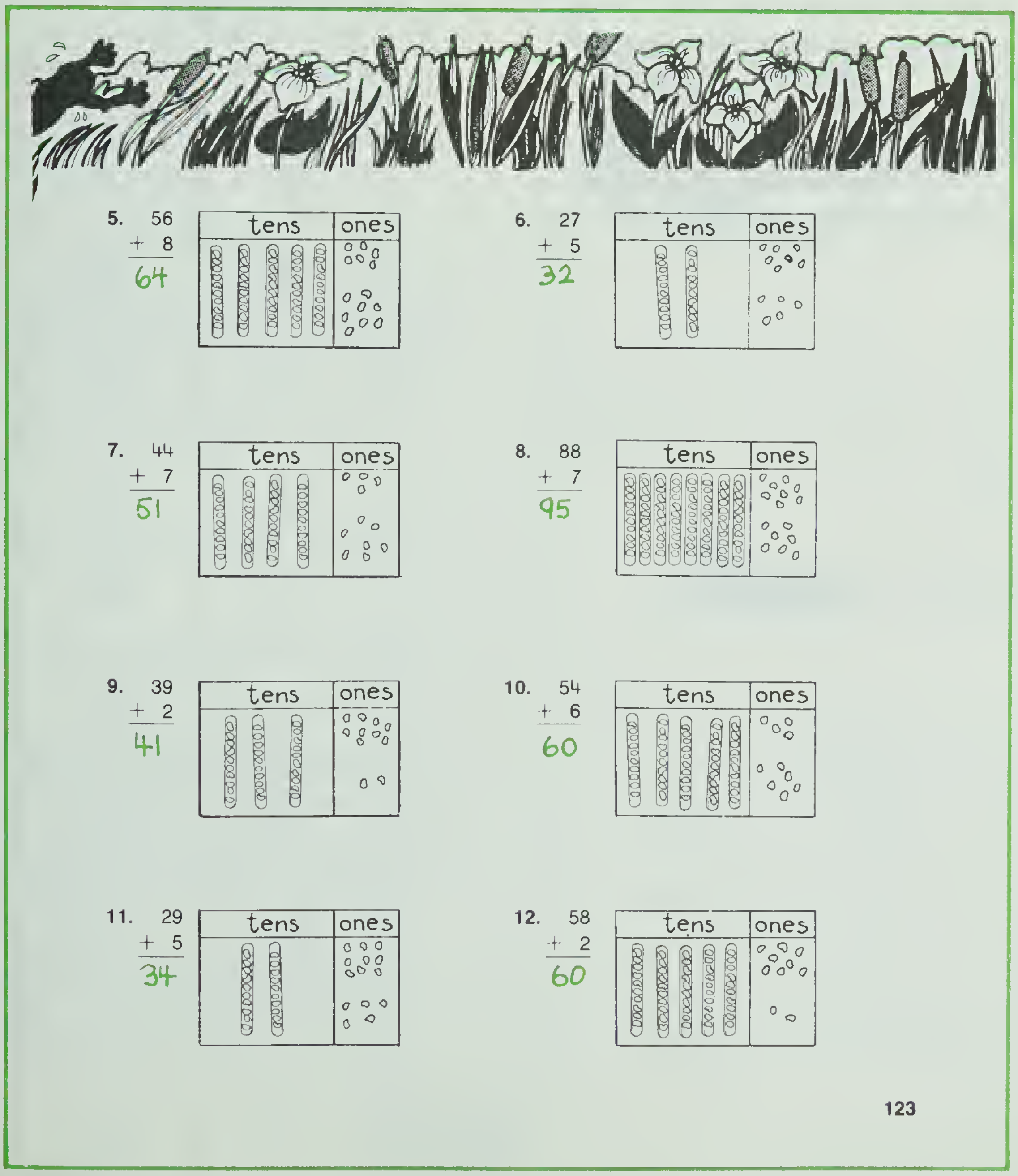
mathways 3, pages 122, 123
Before assigning these pages, call on children to explain the examples shown. Have other children demonstrate the same addition questions, using place-value materials on place-value mats.

☐ ☐

Select activities designed for *mathways 3* pages 10 to 19, 27, 28, 36, and 37 to review number facts.

☐ ☐ ☐

Have groups of five children play Bank the Beans. One group member is designated Banker. The Banker distributes place-value materials to the value of 100 to each player. The players take turns rolling the specially marked die. After each roll, the player gives the Banker the number of beans indicated by the numeral on the upturned face of the die. This may involve exchanging. The first player who has no beans left is the winner.



5. 56
+ 8
64

6. 27
+ 5
32

7. 44
+ 7
51

8. 88
+ 7
95

9. 39
+ 2
41

10. 54
+ 6
60

11. 29
+ 5
34

12. 58
+ 2
60

123

For Your Notes

Unit 2 Section 5 Lesson 4

Adding a Two-Digit and a One-Digit Number: Expanded Numerals

Materials

- for each group of four
  - gameboard, *see* ☐ ☐
  - die marked 4, 5, 6, 7, 8, 9
  - eight counters: two red, two green, two yellow, two blue

Lesson

1

Gather the children around the easel. Write

$$\begin{array}{r} 28 \\ +\ 6 \\ \hline \end{array}$$

Rewrite the question in expanded form.

$$\begin{array}{rl} 20 & +\ 8 \\ + & \ \ \ 6 \\ \hline \end{array}$$

Have a child come forward and write the sum in expanded form.

$$\begin{array}{rl} 20 & +\ 8 \\ + & \ \ \ 6 \\ \hline 20 & +\ 14 \end{array}$$

Have a child write the sum as it would appear after the exchange of 10 ones for 1 ten.

$$\begin{array}{r} 28 \\ +\ 6 \\ \hline 34 \end{array}$$

Repeat several times. Include addition questions whose sums have zero ones, such as 31 + 9. Elicit participation by having children tell you what to record at each stage of the procedure.

2

Write two or three addition questions that require regrouping on the easel. Have children complete them, unassisted if possible, by following the procedure outlined in the previous activity. Continue until each child has completed a question.

Written and Other Activities

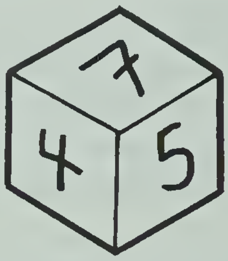
☐

mathways 3, page 124

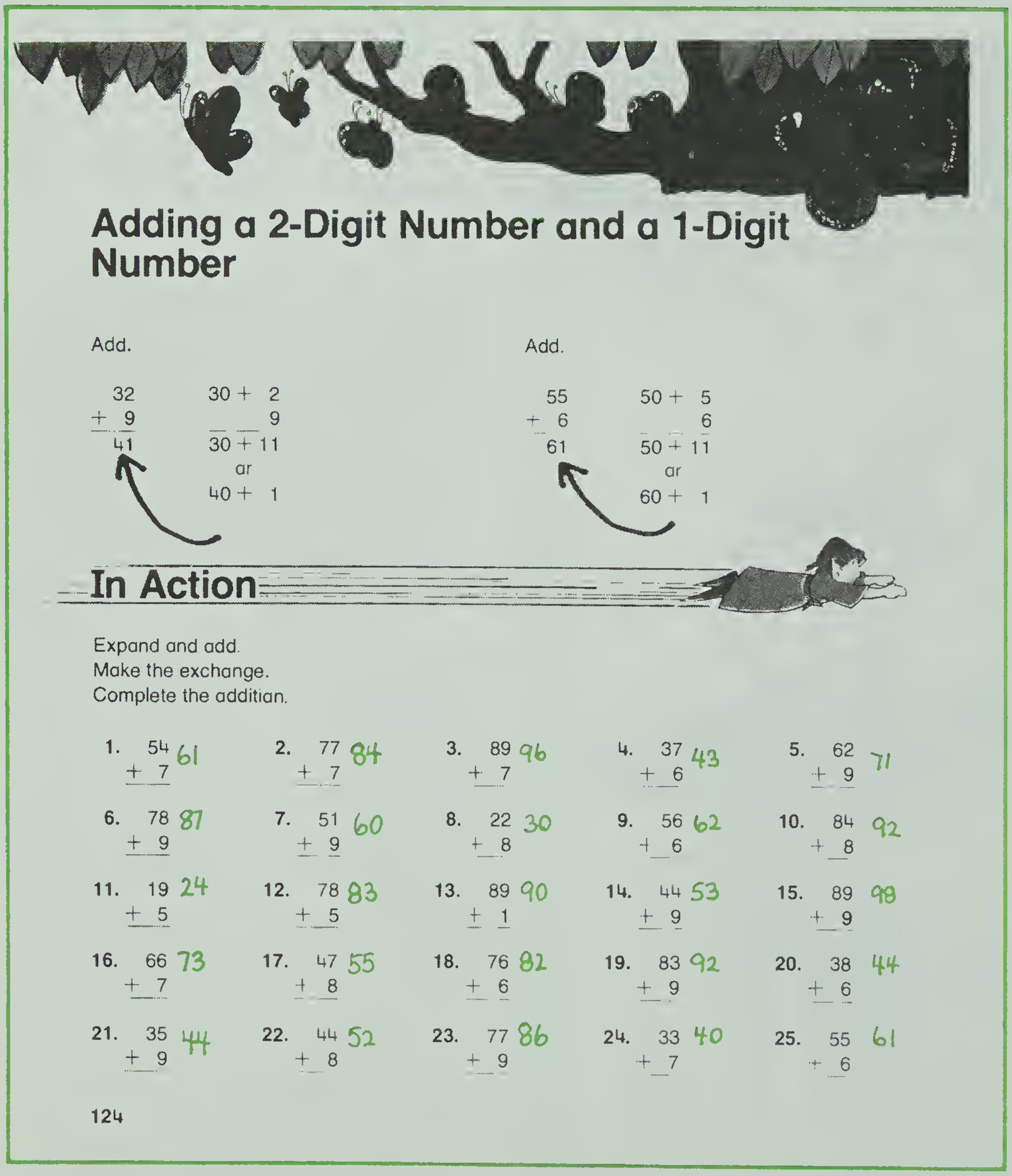
Before assigning the In Action questions, discuss the examples.

☐ ☐

Have groups of four children play Number Line. Provide a gameboard, as illustrated, and a die marked 4 to 9.



	Tens	Ones
	9	9
	8	8
	7	7
	6	6
	5	5
	4	4
	3	3
	2	2
	1	1
START	0	0



Adding a 2-Digit Number and a 1-Digit Number

Add.

$$\begin{array}{r} 32 \\ +\ 9 \\ \hline 41 \end{array} \qquad \begin{array}{rl} 30\ + & 2 \\ & 9 \\ \hline 30\ + & 11 \\ \text{or} & \\ 40\ + & 1 \end{array}$$

Add.

$$\begin{array}{r} 55 \\ +\ 6 \\ \hline 61 \end{array} \qquad \begin{array}{rl} 50\ + & 5 \\ & 6 \\ \hline 50\ + & 11 \\ \text{or} & \\ 60\ + & 1 \end{array}$$

In Action

Expand and add.
Make the exchange.
Complete the addition.

1. 54 + 7 61	2. 77 + 7 84	3. 89 + 7 96	4. 37 + 6 43	5. 62 + 9 71
6. 78 + 9 87	7. 51 + 9 60	8. 22 + 8 30	9. 56 + 6 62	10. 84 + 8 92
11. 19 + 5 24	12. 78 + 5 83	13. 89 + 1 90	14. 44 + 9 53	15. 89 + 9 98
16. 66 + 7 73	17. 47 + 8 55	18. 76 + 6 82	19. 83 + 9 92	20. 38 + 6 44
21. 35 + 9 44	22. 44 + 8 52	23. 77 + 9 86	24. 33 + 7 40	25. 55 + 6 61

124

Give each player two counters in either red, green, yellow or blue. Each player places one counter on 0. Each player, in turn, rolls the die and moves the counter on 0 to the number indicated by the numeral on the die. For each turn following, players roll the die, add the new number to the one marked by the counter on the gameboard, then move the counter to show the combined number. When any player's sum is greater than 9, that child puts the second counter on 10 and moves the first counter to the ones column to show the ones in the sum. For example, if the first counter is on 4 and the next roll indicates add 8, the player puts the second counter on 10 and moves the first counter to 2 to show the sum 12. The first player to reach 99 wins. Children enjoy this game, and it reinforces the concept of place value and provides a good review of number facts, extensions, and regrouping.

□ □ □

To reinforce the concept of the commutative property of addition and provide practice in regrouping, have the children complete questions such as the following:

$$\text{1.}\ \begin{array}{r} 73 \\ +\ 9 \\ \hline \end{array} \quad \text{2.}\ \begin{array}{r} 9 \\ +73 \\ \hline \end{array} \quad \text{3.}\ \begin{array}{r} 64 \\ +\ 5 \\ \hline \end{array} \quad \text{4.}\ \begin{array}{r} 5 \\ +64 \\ \hline \end{array}$$

$$\text{5.}\ \begin{array}{r} 30 \\ +\ 4 \\ \hline \end{array} \quad \text{6.}\ \begin{array}{r} 4 \\ +30 \\ \hline \end{array} \quad \text{7.}\ \begin{array}{r} 26 \\ +\ 7 \\ \hline \end{array} \quad \text{8.}\ \begin{array}{r} 7 \\ +26 \\ \hline \end{array}$$

$$\text{9.}\ \begin{array}{r} 52 \\ +\ 8 \\ \hline \end{array} \quad \text{10.}\ \begin{array}{r} 8 \\ +52 \\ \hline \end{array} \quad \text{11.}\ \begin{array}{r} 49 \\ +\ 2 \\ \hline \end{array} \quad \text{12.}\ \begin{array}{r} 2 \\ +49 \\ \hline \end{array}$$

□ □ □ □

Have each of the children select one of the addition questions from the In Action section and tell a story problem using those numbers. A model may help.

54 yellow cars passed the school.
Seven black cars passed too.
How many yellow and black cars passed the school?

□ □ □ □ □

As a challenge for some of the children, provide addition questions where one addend and the sum are known. The task then is to have the children find the missing addend.

$$\begin{array}{r} 27 \\ +\ \square \\ \hline 32 \end{array} \quad \begin{array}{r} 39 \\ +\ \square \\ \hline 40 \end{array} \quad \begin{array}{r} 54 \\ +\ \square \\ \hline 60 \end{array} \quad \begin{array}{r} \square\square \\ +\ 8 \\ \hline 70 \end{array} \quad \begin{array}{r} \square\square \\ +\ 5 \\ \hline 41 \end{array} \quad \begin{array}{r} \square\square \\ +\ 6 \\ \hline 83 \end{array}$$

□ □ □ □ □ □

Have the children prepare oral puzzles to present to group members. Record one or two on the easel as models.

I add a number to 45.
The sum of the two numbers is 51.
What is the number?

I add seven to a number.
The sum of the two numbers is 83.
What is the number?

Give each child an opportunity to read her or his puzzles to the group. Some children may enjoy recording the puzzles on a tape recorder for others to use in a Math centre.

□ □ □ □ □ □ □

mathways 3 Practice Masters page 25

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mathways 3 Plus Workbook pages 32 and 33

For Your Notes

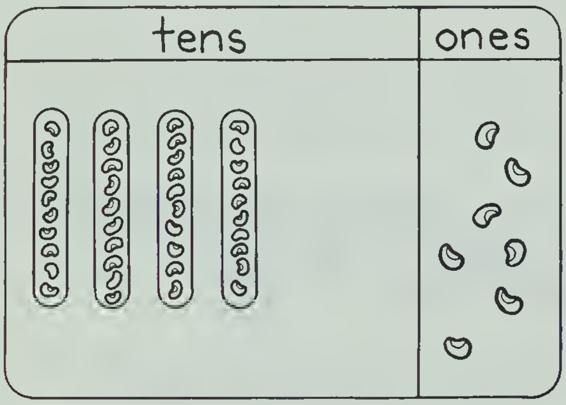
Unit 2 Section 6 Lesson 1
Subtracting a One-Digit Number from a Two-Digit Number: No Regrouping

Materials
- for each child
  - – place-value mat
  - – place-value material
  - – 10-strips and unit strips made from Program Masters 19 and 20

Lesson
1

Invite the children into the working area. Deposit the place-value materials in the centre and distribute the place-value mats. On the easel write

47
− 2

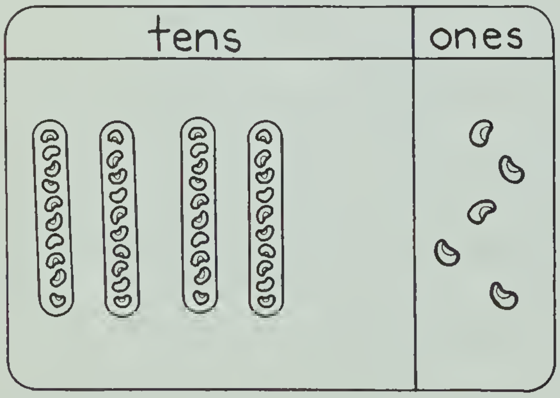


Have the children show the minuend on their place-value mats and take away material to show the subtraction. Ask

How many ones are there?
How many tens are there?

Have a child record the number of ones and tens on the easel. Have another child write the answer under the question.

47
− 2
45



Write

4 tens + 5

Write several more subtraction questions that do not involve regrouping and repeat the procedure. Emphasize that only the minuend is represented by putting material on the mats; the subtrahend is shown by taking material away, and the difference is shown by the materials that are left on the mat. Ask a child to explain the difference between this procedure and the one used to show addition.

2

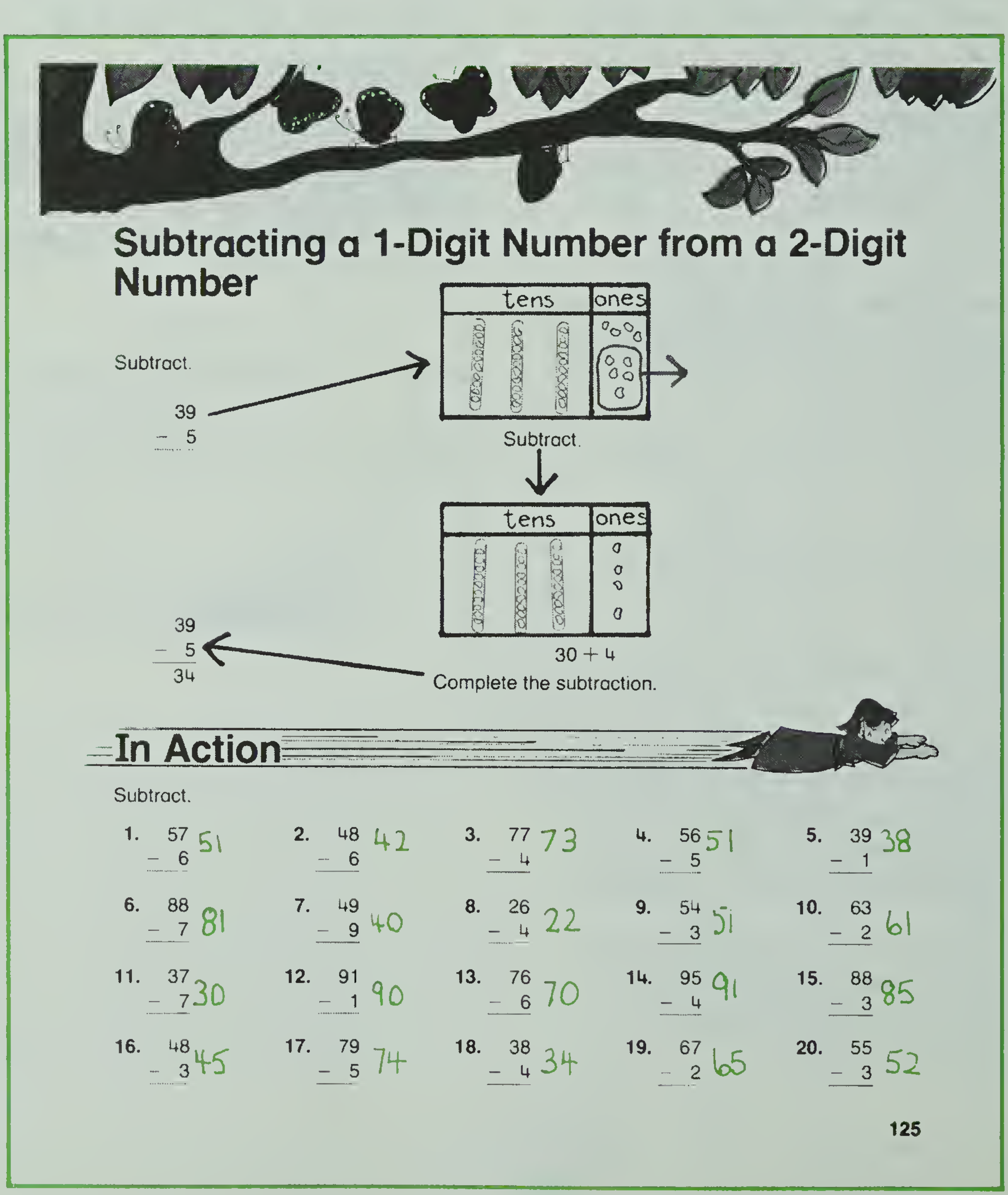
Write another basic subtraction question. Have a child complete it without using place-value materials. Repeat until each child has had an opportunity to demonstrate proficiency. Alternatively, have the children copy questions from the easel, complete them and exchange papers for checking.

3

On the easel, write a subtraction question on a place-value easel chart.

tens	ones
4	8
−	5
4	3

Have a child tell the difference and write it on the easel chart.



Subtracting a 1-Digit Number from a 2-Digit Number

Subtract.

39
− 5

39
− 5
34

30 + 4

Complete the subtraction.

In Action

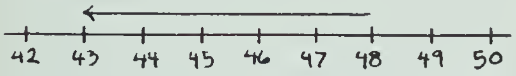
Subtract.

1. 57 − 6 51	2. 48 − 6 42	3. 77 − 4 73	4. 56 − 5 51	5. 39 − 1 38
6. 88 − 7 81	7. 49 − 9 40	8. 26 − 4 22	9. 54 − 3 51	10. 63 − 2 61
11. 37 − 7 30	12. 91 − 1 90	13. 76 − 6 70	14. 95 − 4 91	15. 88 − 3 85
16. 48 − 3 45	17. 79 − 5 74	18. 38 − 4 34	19. 67 − 2 65	20. 55 − 3 52

125

4

Draw a number line on the easel and write a subtraction question. Show the subtraction by drawing an arrow that begins at the minuend, continues left the number of units in the subtrahend and ends at the difference. Have a child come forward and complete the subtraction question.



48 − 5 = 43

5

Review the inverse relation between addition and subtraction by writing questions such as the following on the easel:

$$\begin{array}{r} 69 \\ +\ 9 \\ \hline 78 \end{array} \qquad \begin{array}{r} 78 \\ -\ 9 \\ \hline 69 \end{array}$$

Explain that addition can be used to check subtraction questions.

Written and Other Activities

☐

mathways 3, page 125

Discuss the illustrations and examples, and have the children demonstrate each with place-value material on a place-value mat. Assign the In Action questions.

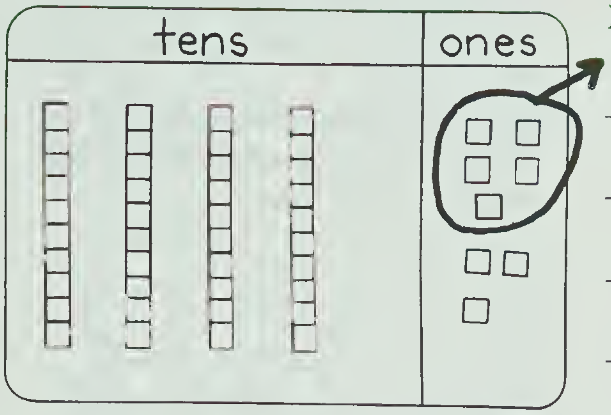
☐ ☐

Have the children use addition to check their answers to the In Action questions.

☐ ☐ ☐

Have the children glue 10-strips and unit strips, made from Program Masters 19 and 20, on place-value mats to illustrate a subtraction question. For example

$$\begin{array}{r} 48 \\ -\ 5 \\ \hline 43 \end{array}$$



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mathways 3 Practice Masters page 26

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mathways 3 Plus Workbook page 35

For Your Notes

Unit 2 Section 6 Lesson 2

Adding and Subtracting

Materials

- for each group
  - shoe box lid
  - modelling clay
  - 50 marbles or pebbles
  - paints

Lesson

1

Gather the children around the easel.

Write

31
+ 5

Have a child complete the question.

Ask

Why didn't Louis exchange 10 ones for 1 ten?

Emphasize that an exchange is not possible unless there are more than 9 ones in the ones column. Ask

What numeral is three greater than the sum 36?

Have a child write the question 36 + 3 and another child write the sum 39, using the vertical form.

2

Write

42
+ 9

Have a child expand the two-digit addend.

40 + 2
+ 9

Have another child write the expanded sum under the question. Ask a third child to write the expanded sum after the ones have been exchanged for a ten.

40 + 11 or 50 + 1

Ask

Why did Marie exchange 10 ones for 1 ten?

A child responds

There were more than 9 ones in the ones column.

Ask

What number is 10 greater than the sum 51?

Have a child write

51 + 10 = 60 + 1.

3

Write

38
− 4

Have a child record the difference. Ask

What number is 10 less than 34? Do we need to subtract 10 ones or 1 ten to find the answer? Why?

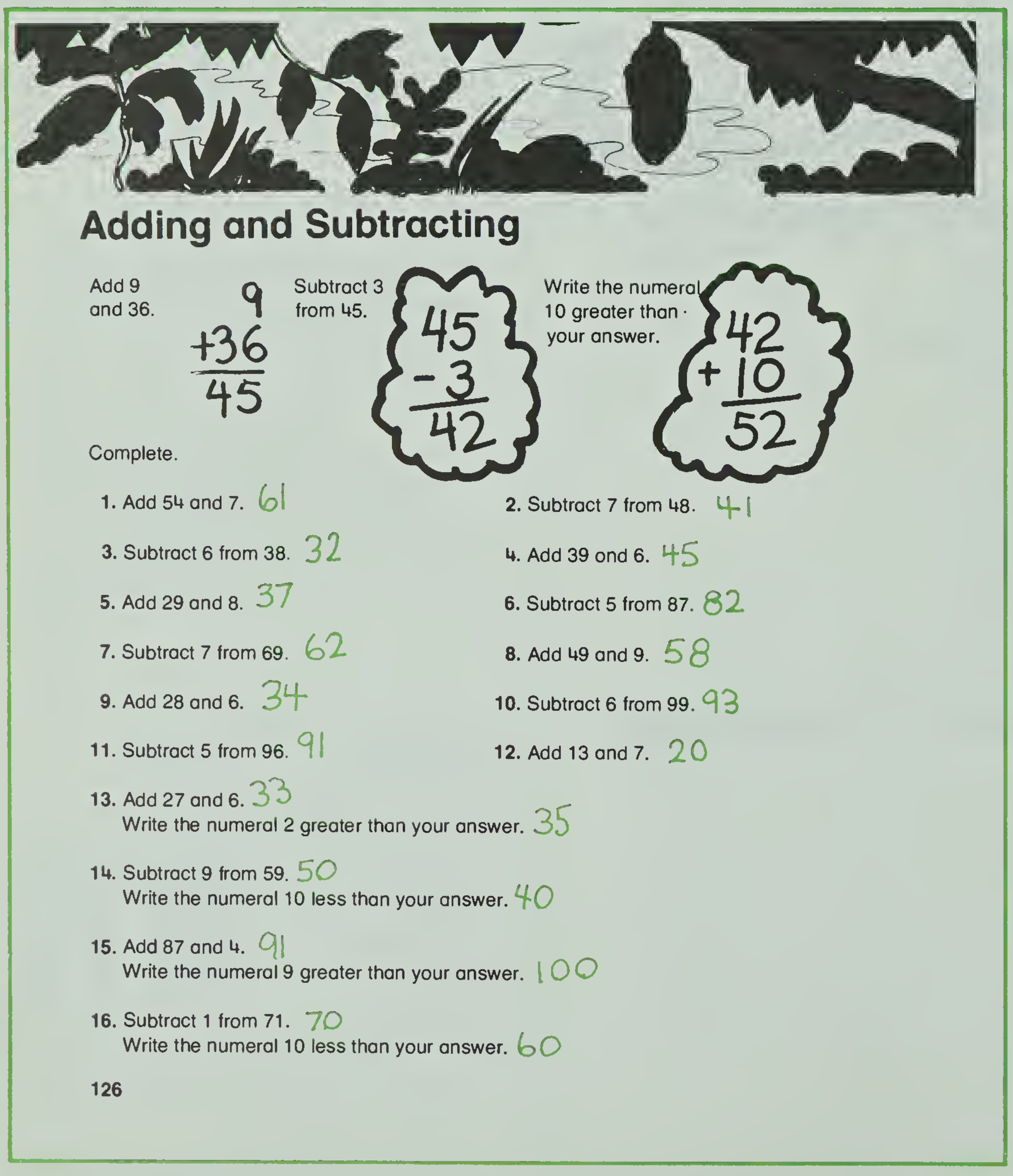
Repeat, inviting different children to participate in completing each question.

Written and Other Activities

☐

mathways 3, page 126

Have children take turns reading the sample questions. Discuss each before assigning the exercise.



Adding and Subtracting

Add 9 and 36.

9
+36
45

Subtract 3 from 45.

45
−3
42

Write the numeral 10 greater than your answer.

42
+10
52

Complete.

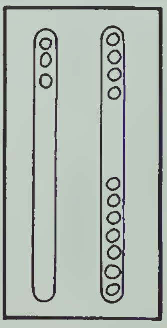
1. Add 54 and 7. 61
2. Subtract 7 from 48. 41
3. Subtract 6 from 38. 32
4. Add 39 and 6. 45
5. Add 29 and 8. 37
6. Subtract 5 from 87. 82
7. Subtract 7 from 69. 62
8. Add 49 and 9. 58
9. Add 28 and 6. 34
10. Subtract 6 from 99. 93
11. Subtract 5 from 96. 91
12. Add 13 and 7. 20
13. Add 27 and 6. 33
    Write the numeral 2 greater than your answer. 35
14. Subtract 9 from 59. 50
    Write the numeral 10 less than your answer. 40
15. Add 87 and 4. 91
    Write the numeral 9 greater than your answer. 100
16. Subtract 1 from 71. 70
    Write the numeral 10 less than your answer. 60

126

☐ ☐

Some children may enjoy making a type of abacus that historians believe to be the earliest kind used. Have the children fill the lid of a shoe box with modelling clay. While the clay is still moist trace two channels, each long enough to accommodate 19 marbles or pebbles. When the clay is dry, paint the abacus. For each abacus provide a small bag of 40 or 50 marbles or pebbles. Have the children use them to add and subtract.

34
+ 7



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mathways 3 Plus Workbook page 36

Unit 2 Section 6 Lesson 3

Making an Exchange: Regrouping Tens and Ones

Materials

- for each child
  - place-value material
  - place-value mat

Rationale

This lesson is designed to prepare children to do subtraction questions that require regrouping tens and ones. Emphasis on the equivalence between 1 ten and 10 ones helps children understand that the minuend does not actually change as a result of regrouping.

Lesson

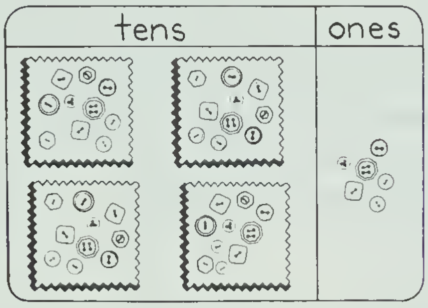
1

Gather the children around the easel in the working area. Distribute place-value materials and mats. Write

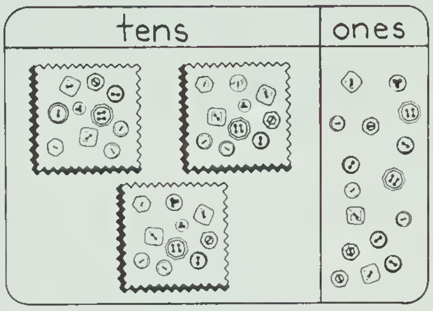
46

40 + 6

Have the children represent 46 on their place-value mats.



Explain that to complete some subtraction questions it is necessary to exchange 1 ten for 10 ones. Have the children exchange one 10-strip for 10 unit strips and rearrange the material on their mats.



Discuss the idea that 40 + 6 and 30 + 16 are both representations of 46. Repeat the procedure with several other examples, including a few that involve zero ones.

2

Write

30 + 5 = ____ + 15

Use place-value materials on a mat to demonstrate part of the exchange, then have a child complete it. Have another child fill in the answer on the easel. Repeat several times. Include a few examples that require the children to show both parts of an exchange.

50 + 8 = ____ + ____

3

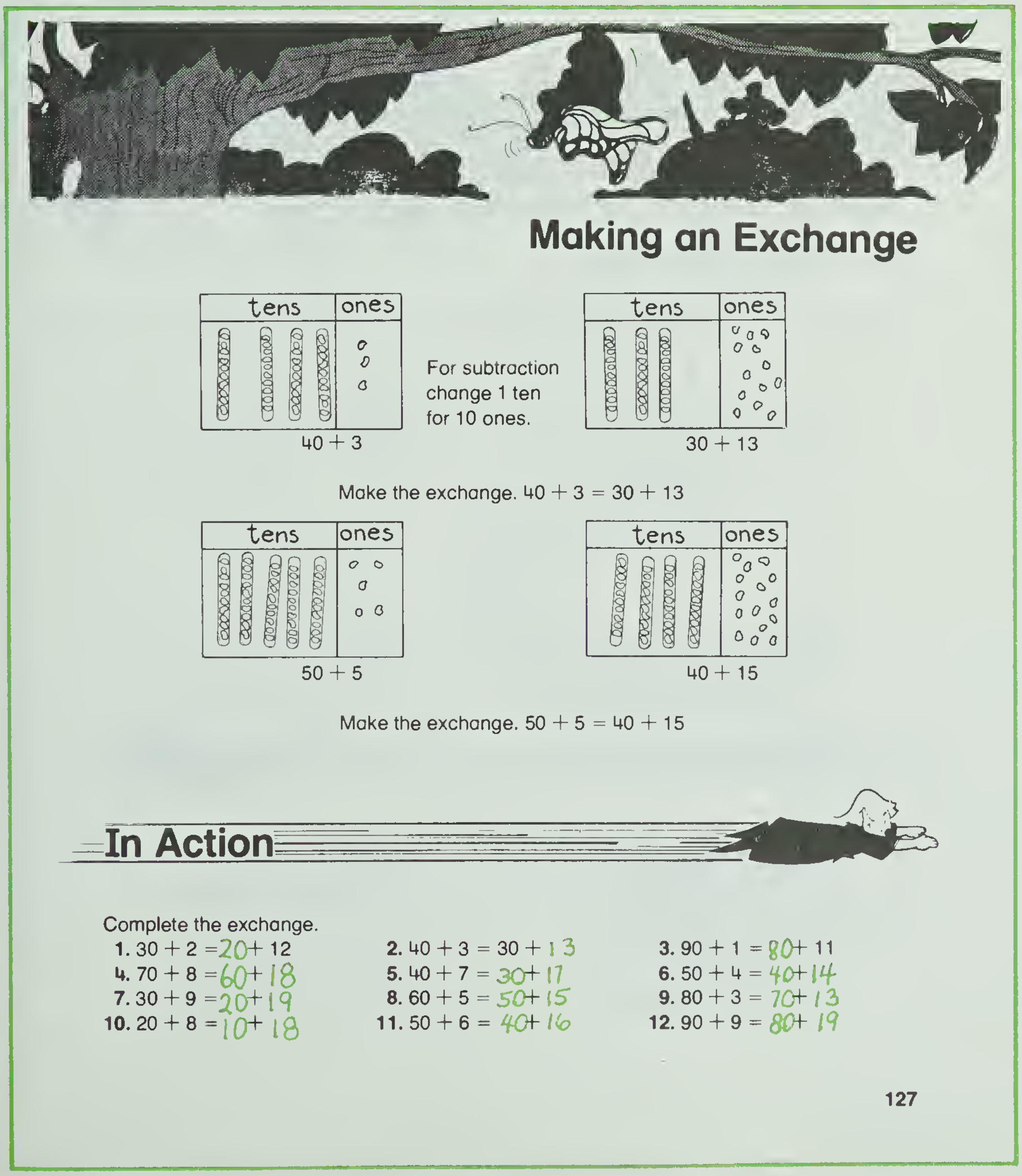
Write several numerals from 20 to 98 on the easel. Have children write the expanded form beside each. Then with the help of the children and using place-value materials, develop equations that result when 1 ten is exchanged for 10 ones.

Written and Other Activities

☐

mathways 3, page 127

Before assigning the In Action exercise, select children to read the examples aloud and describe the exchange that each example illustrates.



Making an Exchange

For subtraction change 1 ten for 10 ones.

Make the exchange. 40 + 3 = 30 + 13

Make the exchange. 50 + 5 = 40 + 15

In Action

Complete the exchange.

1. 30 + 2 = 20 + 12
2. 40 + 3 = 30 + 13
3. 90 + 1 = 80 + 11
4. 70 + 8 = 60 + 18
5. 40 + 7 = 30 + 17
6. 50 + 4 = 40 + 14
7. 30 + 9 = 20 + 19
8. 60 + 5 = 50 + 15
9. 80 + 3 = 70 + 13
10. 20 + 8 = 10 + 18
11. 50 + 6 = 40 + 16
12. 90 + 9 = 80 + 19

Unit 2 Section 6 Lesson 4

Subtracting a One-Digit Number from a Two-Digit Number: Regrouping Tens and Ones

Materials

- for each child
  - place-value material
  - place-value mat
  - 10-strips and unit strips made from Program Masters 19 and 20
- for each group
  - subtraction cards, *see* ☐ ☐ ☐

Lesson

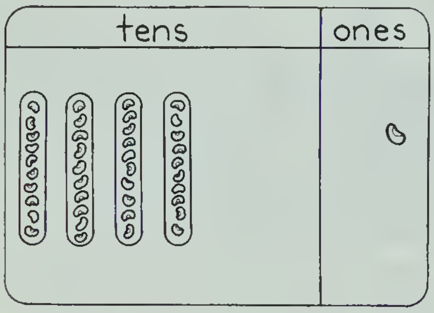
1

Gather the children around the easel. Distribute place-value material and mats. Write

41
− 7

Have the children show 41 on their mats. Then write

40 + 1

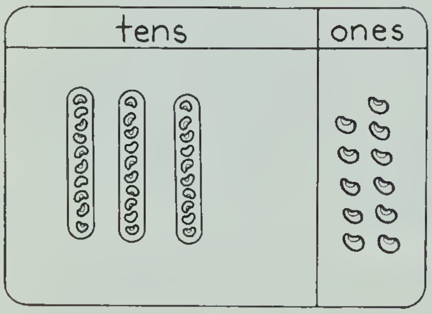


Ask

Can a group of seven objects be separated from just one object?

Manage the ensuing discussion to show that since seven is greater than one, 1 ten must be exchanged for 10 ones to complete the subtraction question. Have the children make the exchange, and record the transaction.

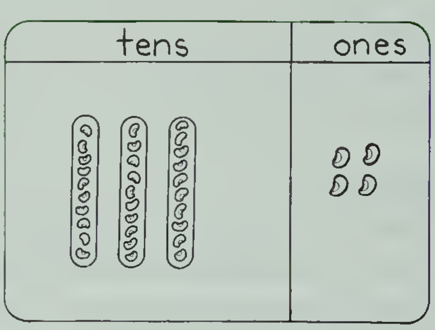
30 + 11



Discuss that 30 + 11 and 40 + 1 are two ways of representing the same number.

Explain that the exchange would not have been necessary if the subtraction question had been 48 − 7, since 8 is greater than 7. Then have the children show the subtraction of 7 ones from 11 ones on their place-value mats to find the difference for the question 41 − 7. Have a child record the answer under the question on the easel.

41
− 7
34



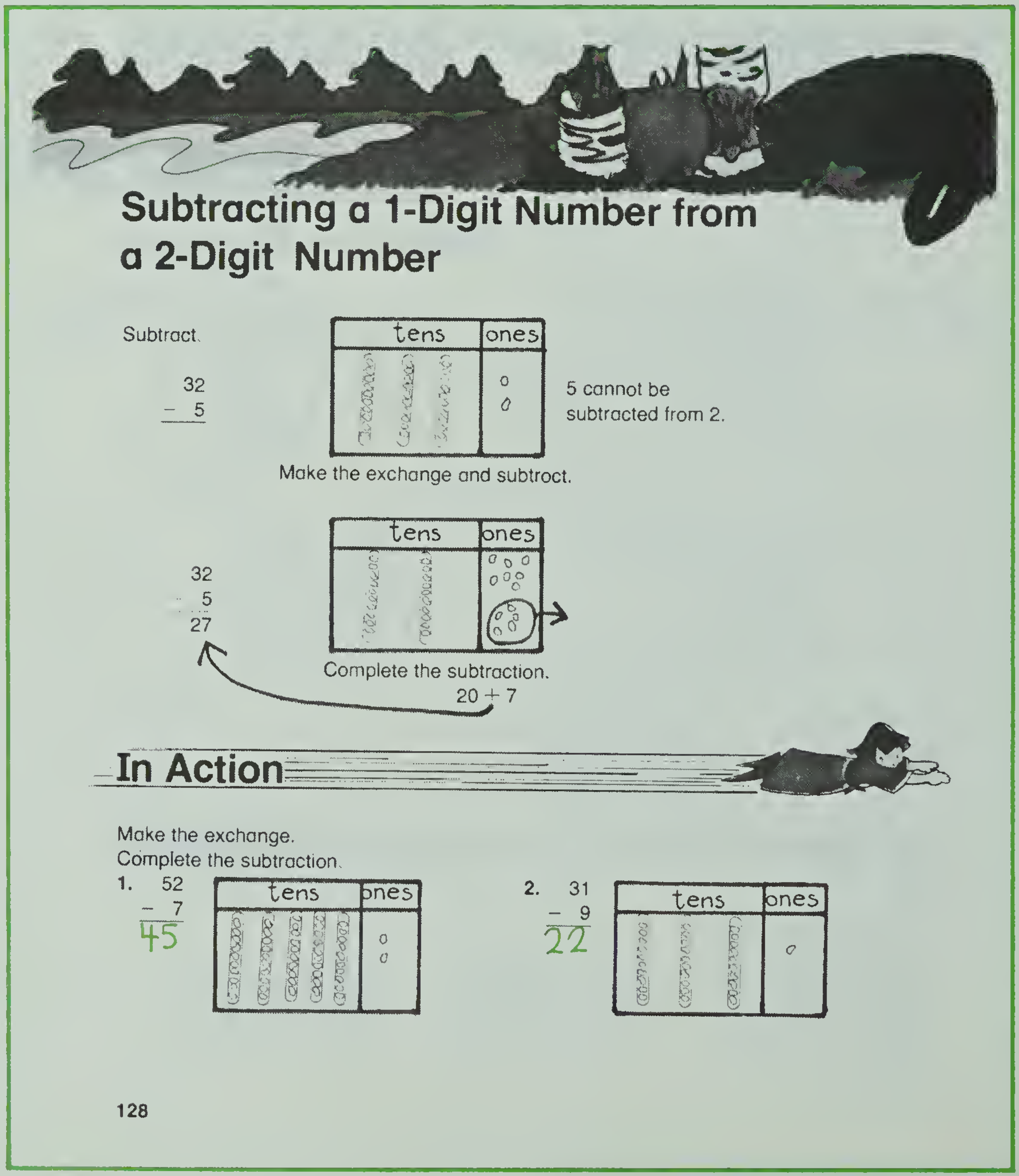
Repeat several times. Include questions that involve zero ones in the minuend, such as 50 − 7.

2

Write

54
− 8

Have the children participate in developing and recording the expanded minuend on the easel.



Subtracting a 1-Digit Number from a 2-Digit Number

Subtract.

32
− 5

5 cannot be subtracted from 2.

Make the exchange and subtract.

32
− 5
27

Complete the subtraction.

20 + 7

In Action

Make the exchange.
Complete the subtraction.

1. 52
   − 7
   45
2. 31
   − 9
   22

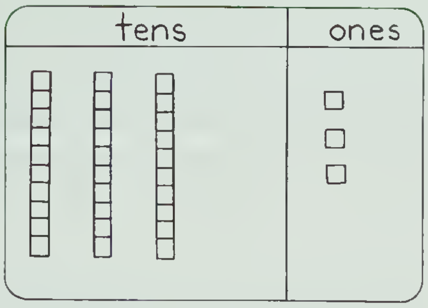
128

Discuss the exchange necessary to complete the question without using place-value material. Emphasize that 50 + 4 and 40 + 14 are two ways of showing 54. Have the children tell you the difference for the question 54 − 8 as you record the answer on the easel. Remind the children that if the question had been 58 − 4 no exchange would have been necessary. Invite a child to explain why not.

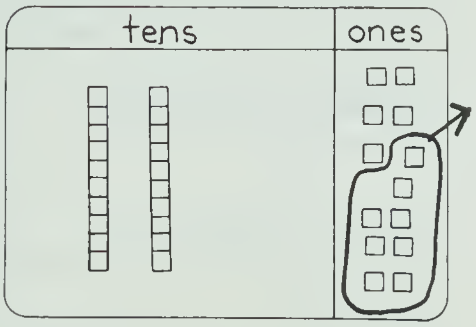
3

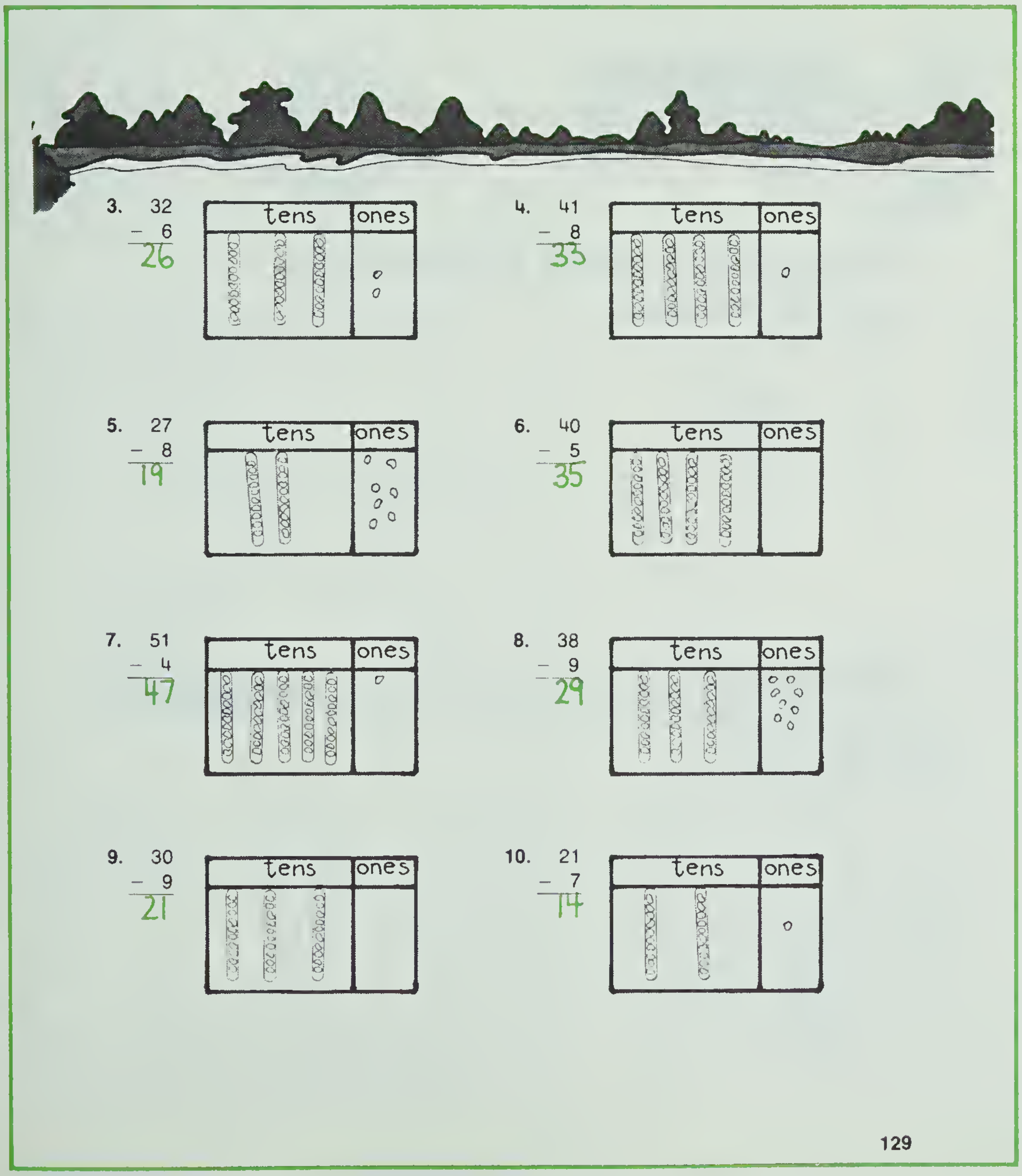
Have the children glue 10-strips and unit strips on place-value mats to illustrate a subtraction question.

33
− 8



33
− 8
25





3. 32
− 6
26

4. 41
− 8
33

5. 27
− 8
19

6. 40
− 5
35

7. 51
− 4
47

8. 38
− 9
29

9. 30
− 9
21

10. 21
− 7
14

129

Written and Other Activities

☐

mathways 3, pages 128, 129

Select children to explain the steps in each of the examples at the top of the pages. Assign the exercises.

☐ ☐

Have the children use place-value charts to illustrate subtraction questions, as shown.

	tens	ones
	3	1
−		6

	tens	ones
	2	11
−		6
	2	5

☐ ☐ ☐

Prepare a deck of cards by writing a subtraction question on each. Include questions that require exchanging tens for ones and questions that do not. Make sure that all the subtrahends are single digits.

Groups of four children can use the cards to play a game. The leader shows the other players one card at a time. The first player to say *Exchange* or *Don't exchange* takes the card. When all the cards have been taken, the player with the greatest number of cards wins and becomes the new leader.

☐ ☐ ☐ ☐

Have groups of children use the deck of cards prepared for the previous activity to practise subtraction. One child draws a card. All group members record and complete the subtraction questions and compare the results.

Unit 2 Section 6 Lesson 5

Using Expanded Numerals to Subtract One-Digit Numbers from Two-Digit Numbers

Materials

- for each child
  - – place-value material
  - – place-value mat

Lesson

1

Gather the children around the easel.
Write

$$\begin{array}{r} 35 \\ -\ 7 \\ \hline \end{array}$$

Pointing to the minuend, ask
How many tens are in this number?
How many ones?
Record the expanded form.
Subtract.

$$\begin{array}{r} 30 + 5 \\ 7 \\ \hline \end{array}$$

Stress that 35 and 30 + 5 are two ways of representing the same number.
Then ask
What must we do before we can subtract the 7?
After discussing the need for making an exchange, write
Subtract.

$$\begin{array}{r} 20 + 15 \\ 7 \\ \hline \end{array}$$

Stress that 35, 30 + 5 and 20 + 15 are three ways of representing the same number.
Ask
How many ones will be left after taking away 7 ones?
Record
Subtract.

$$\begin{array}{r} 20 + 15 \\ 7 \\ \hline 20 + \ \ 8 \end{array}$$

Have a child write the answer beneath the question.

$$\begin{array}{r} 35 \\ -\ 7 \\ \hline 28 \end{array}$$

Repeat several times. Select children to record each step on the easel, so that they will become familiar with the procedure. Include questions that have zero ones in the minuend, such as 90 − 5.

2

Write a subtraction question in vertical form on the easel. Have a child demonstrate the procedure for making the necessary exchange and completing the subtraction. Remind the children to record the ones before the tens when writing the difference.

$$\begin{array}{r} 87 \\ -\ 9 \\ \hline 78 \end{array} \quad \text{or} \quad \begin{array}{r} 70 + 17 \\ 9 \\ \hline 70 + \ \ 8 \end{array}$$

Repeat until each child has had an opportunity to do one question.

Written and Other Activities

☐

mathways 3, page 130

Before assigning the exercise, discuss the example.

☐ ☐

Review the inverse relationship between addition and subtraction. Explain that subtraction can be used to check addition questions, just as addition can be used to check subtraction questions. Have the children check 10 addition questions completed for page 124 by subtracting.

☐ ☐ ☐

Have the children illustrate the steps in the subtraction procedure on place-value mats. Allow them to make up the questions they wish to illustrate.

☐ ☐ ☐ ☐

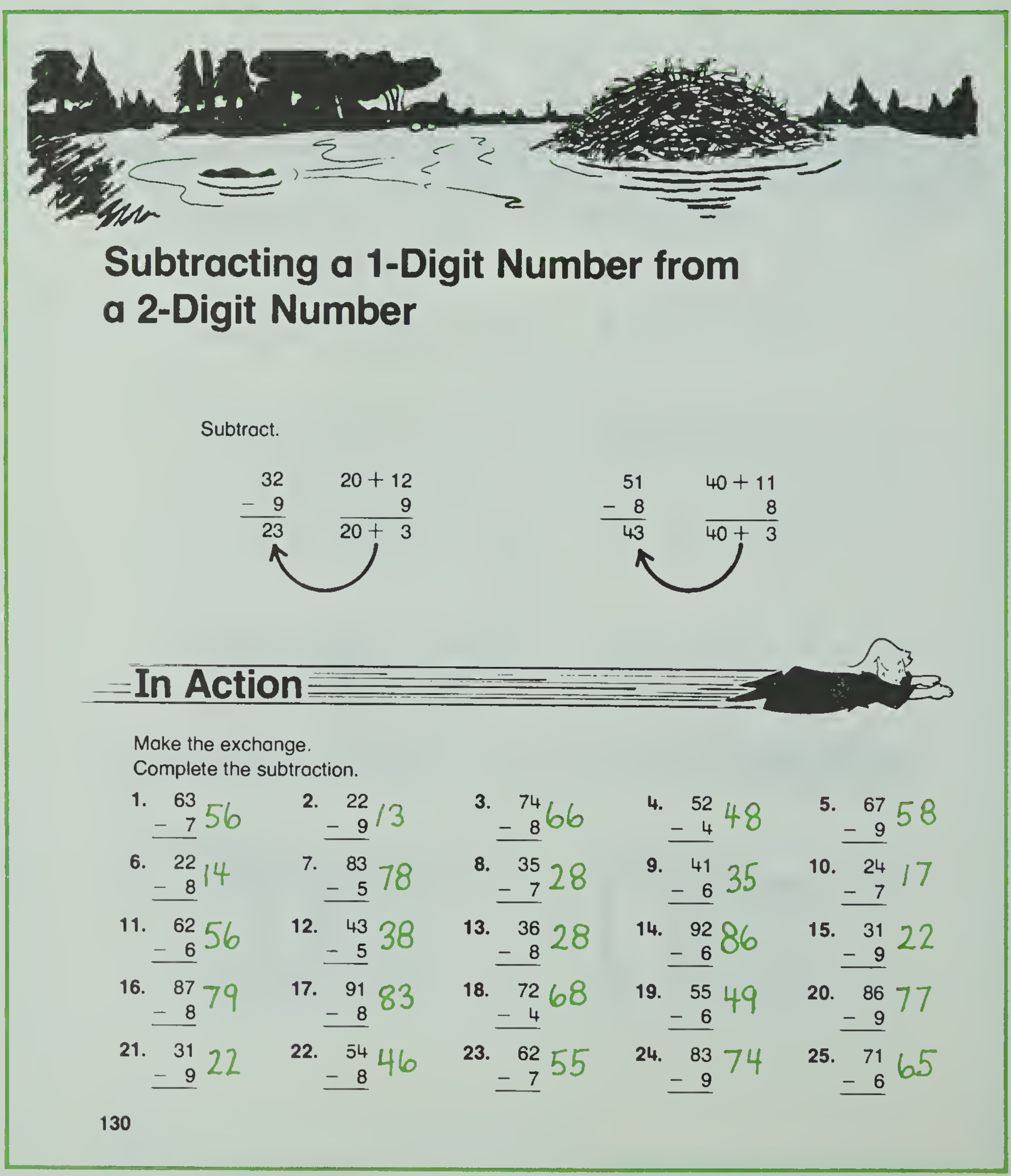
mathways 3 Practice Masters page 27

☐ ☐ ☐ ☐ ☐

mathways 3 Tests 2A, 2B

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 37 and 38



Subtracting a 1-Digit Number from a 2-Digit Number

Subtract.

$$\begin{array}{r} 32 \\ -\ 9 \\ \hline 23 \end{array} \quad \begin{array}{r} 20 + 12 \\ 9 \\ \hline 20 + \ \ 3 \end{array} \qquad \begin{array}{r} 51 \\ -\ 8 \\ \hline 43 \end{array} \quad \begin{array}{r} 40 + 11 \\ 8 \\ \hline 40 + \ \ 3 \end{array}$$

In Action

Make the exchange.
Complete the subtraction.

1. $\begin{array}{r} 63 \\ -\ 7 \\ \hline \end{array}$ 56 2. $\begin{array}{r} 22 \\ -\ 9 \\ \hline \end{array}$ 13 3. $\begin{array}{r} 74 \\ -\ 8 \\ \hline \end{array}$ 66 4. $\begin{array}{r} 52 \\ -\ 4 \\ \hline \end{array}$ 48 5. $\begin{array}{r} 67 \\ -\ 9 \\ \hline \end{array}$ 58

6. $\begin{array}{r} 22 \\ -\ 8 \\ \hline \end{array}$ 14 7. $\begin{array}{r} 83 \\ -\ 5 \\ \hline \end{array}$ 78 8. $\begin{array}{r} 35 \\ -\ 7 \\ \hline \end{array}$ 28 9. $\begin{array}{r} 41 \\ -\ 6 \\ \hline \end{array}$ 35 10. $\begin{array}{r} 24 \\ -\ 7 \\ \hline \end{array}$ 17

11. $\begin{array}{r} 62 \\ -\ 6 \\ \hline \end{array}$ 56 12. $\begin{array}{r} 43 \\ -\ 5 \\ \hline \end{array}$ 38 13. $\begin{array}{r} 36 \\ -\ 8 \\ \hline \end{array}$ 28 14. $\begin{array}{r} 92 \\ -\ 6 \\ \hline \end{array}$ 86 15. $\begin{array}{r} 31 \\ -\ 9 \\ \hline \end{array}$ 22

16. $\begin{array}{r} 87 \\ -\ 8 \\ \hline \end{array}$ 79 17. $\begin{array}{r} 91 \\ -\ 8 \\ \hline \end{array}$ 83 18. $\begin{array}{r} 72 \\ -\ 4 \\ \hline \end{array}$ 68 19. $\begin{array}{r} 55 \\ -\ 6 \\ \hline \end{array}$ 49 20. $\begin{array}{r} 86 \\ -\ 9 \\ \hline \end{array}$ 77

21. $\begin{array}{r} 31 \\ -\ 9 \\ \hline \end{array}$ 22 22. $\begin{array}{r} 54 \\ -\ 8 \\ \hline \end{array}$ 46 23. $\begin{array}{r} 62 \\ -\ 7 \\ \hline \end{array}$ 55 24. $\begin{array}{r} 83 \\ -\ 9 \\ \hline \end{array}$ 74 25. $\begin{array}{r} 71 \\ -\ 6 \\ \hline \end{array}$ 65

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Unit 2 Section 7 Lesson 1

Adding Two-Digit Numbers: Exchanging Tens for Ones

Materials

- for each child
  - place-value materials
  - place-value mats
  - 10-strips and unit strips made from Program Masters 19 and 20

Lesson

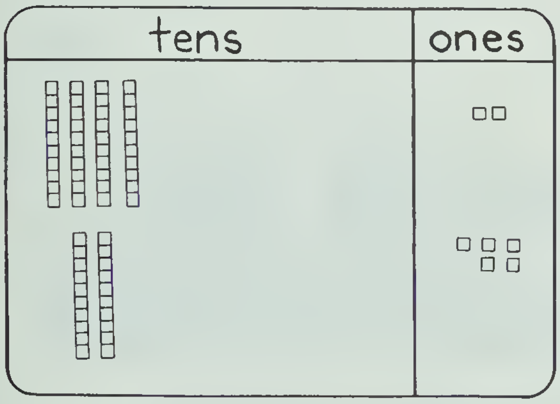
1

Gather the children around the easel. Distribute place-value materials and mats.

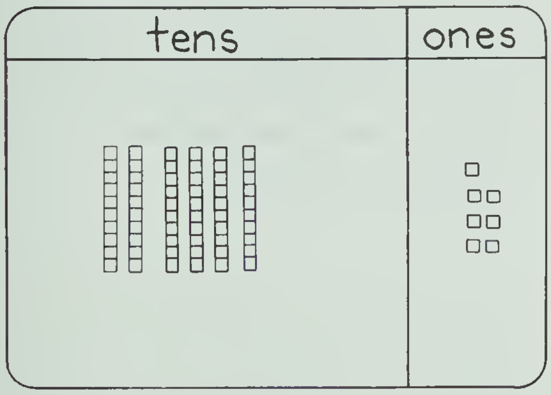
Write on the easel

42
+25

Have the children show the addends on their mats.



Have the children join the materials to show the addition. Write the numeral in expanded form.



60 + 7

Have a child fill in the sum.

42
+25
67

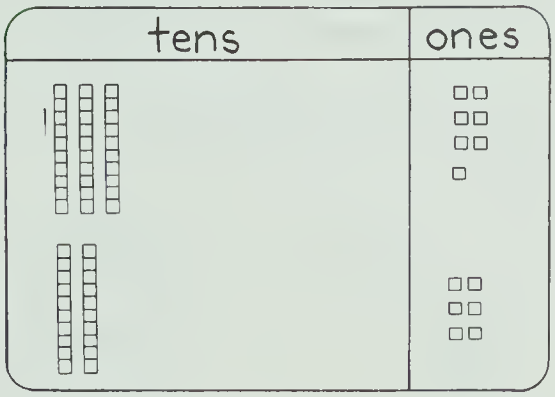
Repeat several times, using questions that do not involve exchanging tens and ones. Include addends that have zero ones, such as 80 + 10, 60 + 23, 15 + 40.

2

Write on the easel

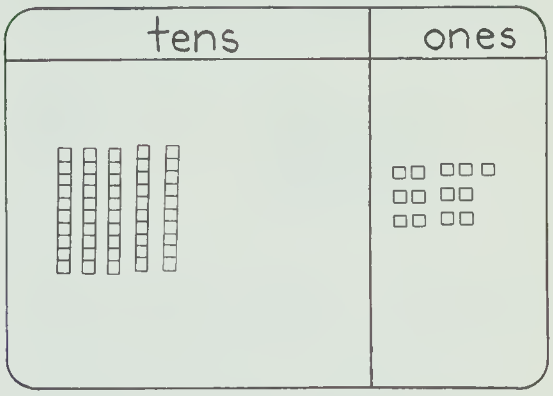
37
+26

Have the children show the addends on their mats.

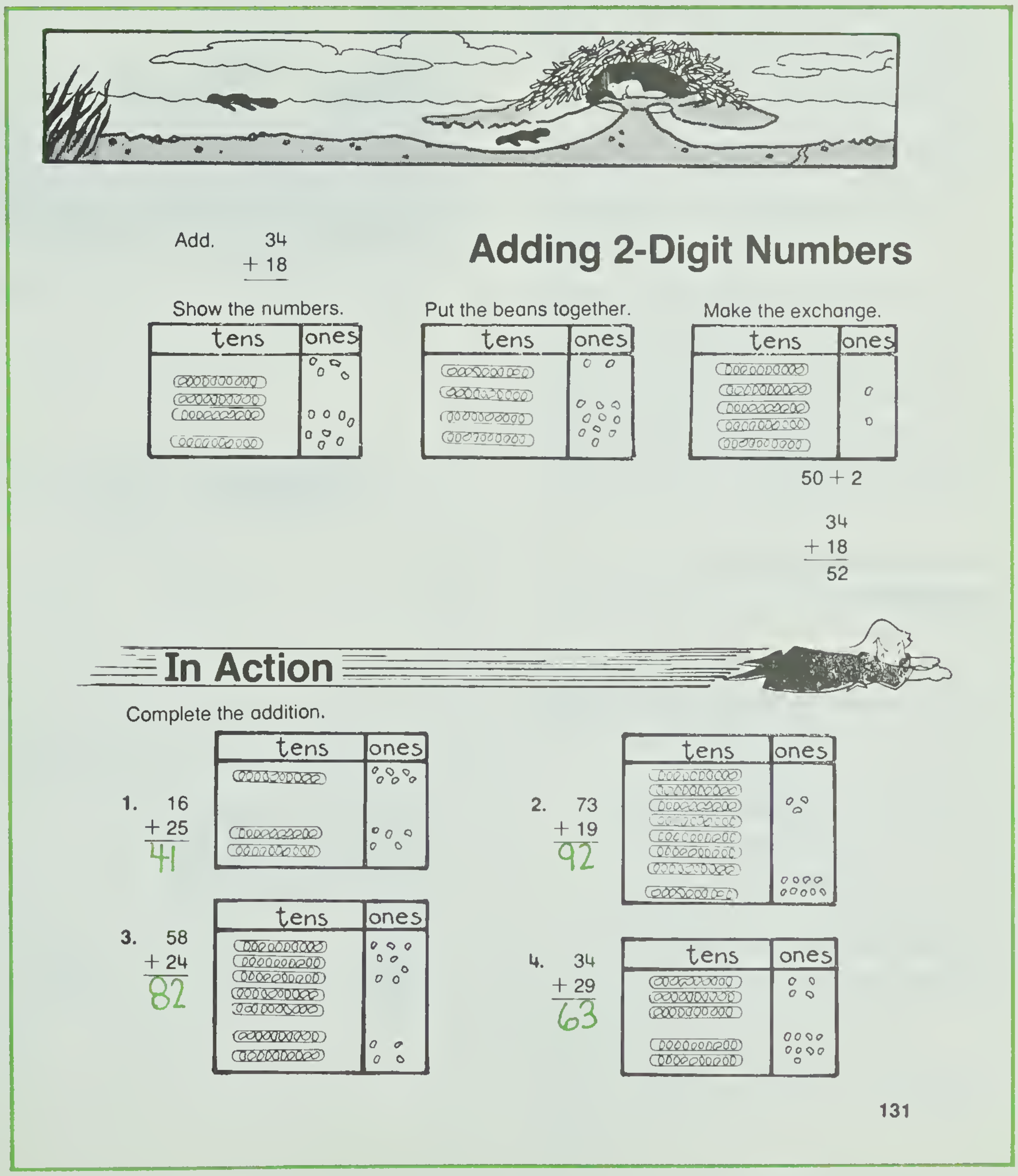


Have them combine their materials to show the addition. Have a child write the sum on the easel in expanded form.

50 + 13



Discuss the need for exchanging 10 ones for 1 ten in order to record the sum.



Add. 34
+ 18

Adding 2-Digit Numbers

Show the numbers.

Put the beans together.

Make the exchange.

50 + 2

34
+ 18
52

In Action

Complete the addition.

1. 16
+ 25
41

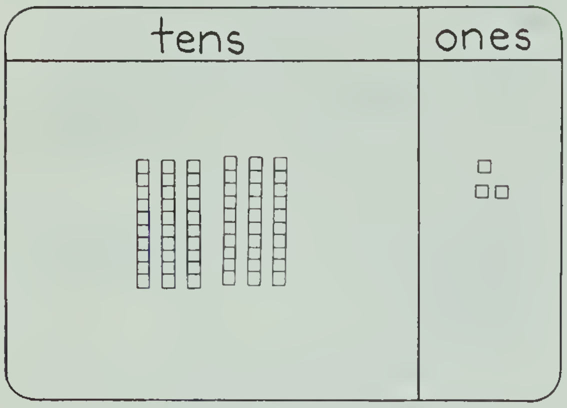
2. 73
+ 19
92

3. 58
+ 24
82

4. 34
+ 29
63

131

Write the sum in expanded form.
60 + 3



Have a child fill in the sum under the question.

37
+26
63

Remind the children to write the ones before writing the tens. Repeat, selecting other examples that require an exchange.

3

Write the following addition questions on the easel:

47	63	70	50	84	28
+19	+37	+23	+20	+15	+66

Select a child to complete one question without using place-value materials and say whether an exchange of 1 ten for 10 ones is necessary. Repeat until all the questions have been dealt with and each child has had an opportunity to work on the easel.

Written and Other Activities

☐

mathways 3, page 131

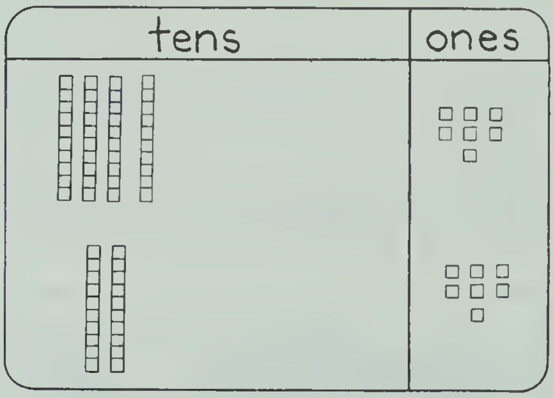
The illustrated examples at the top of the page are designed to bridge the gap between the concrete manipulation of materials and the abstract manipulation of numbers. Have the children take turns explaining the exchanges necessary to complete the examples and the In Action questions.

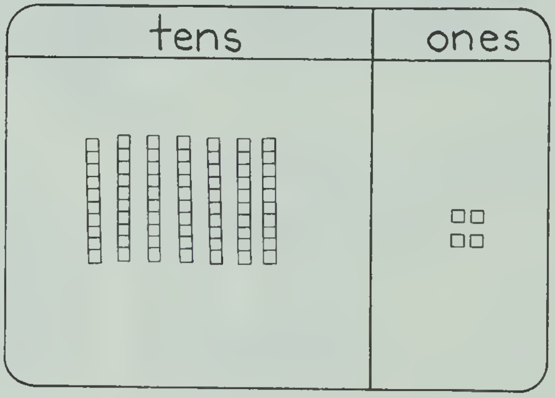
☐ ☐

Have the children make booklets. Each page of the booklet should show one of the following ways of illustrating an addition question in which an exchange takes place:

- 10-strips and unit strips pasted on a place-value mat

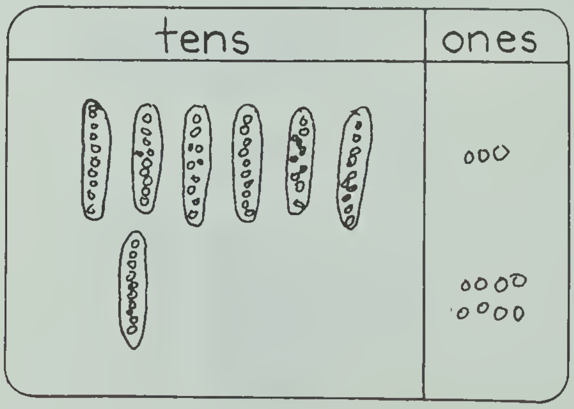
47
+27
74





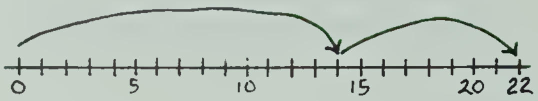
- picture of place-value materials

63
+18



- number line

14
+ 8



- place-value chart

42
+28

tens	ones
4	2
+ 2	8
7	0

- expanded numerals

27	*20 + 7*
+15	*10 + 5*
42	*30 + 12*

☐ ☐ ☐

Write a number of addition questions on the easel. Have the children identify the questions that require an exchange and the questions that do not. Have the children come to the easel and complete the questions.

Unit 2 Section 7 Lesson 2

Adding Two-Digit Numbers: Expanded Numerals

Materials

- for each child
  - copy of half a 100-chart made from Program Master 22

Rationale

This page represents an opportunity for children to use expanded numerals to show the exchange of 10 ones for 1 ten without the aid of place-value material. It is important that the following steps be observed so that the children will regard expanded numerals as an alternative to physically manipulating concrete objects:

- write the question in vertical form

$$\begin{array}{r} 28 \\ +39 \\ \hline \end{array}$$

- expand the addends

$$\begin{array}{r} 20 + 8 \\ +30 + 9 \\ \hline \end{array}$$

- add the ones; add the tens

$$\begin{array}{r} 20 + 8 \\ +30 + 9 \\ \hline 50 + 17 \end{array}$$

- exchange 10 ones for 1 ten

$50 + 17 = 60 + 7$

- write the sum under the question, from right to left

$$\begin{array}{r} 28 \\ +39 \\ \hline 67 \end{array}$$

Lesson

1

Gather the children around the easel. Write

$$\begin{array}{r} 54 \\ +27 \\ \hline \end{array}$$

Ask a child to write the addends in expanded form. Have another child add and record the sum in expanded form.

Add.

$$\begin{array}{r} 50 + 4 \\ 20 + 7 \\ \hline 70 + 11 \end{array}$$

Ask

What must we do before we can record the sum under the question?

A child responds

Exchange 1 ten for 10 ones.

Have the child come to the easel and record the sum.

$$\begin{array}{r} 54 \\ +27 \\ \hline 81 \end{array}$$

Repeat several times until each child has had an opportunity to participate. Include questions resulting in sums that have zero ones, such as 36 + 14.

Written and Other Activities

☐

mathways 3, page 132

Before assigning the questions, have children explain the examples at the top of the page. Discuss the equivalence between the two ways of representing the addends and sums.

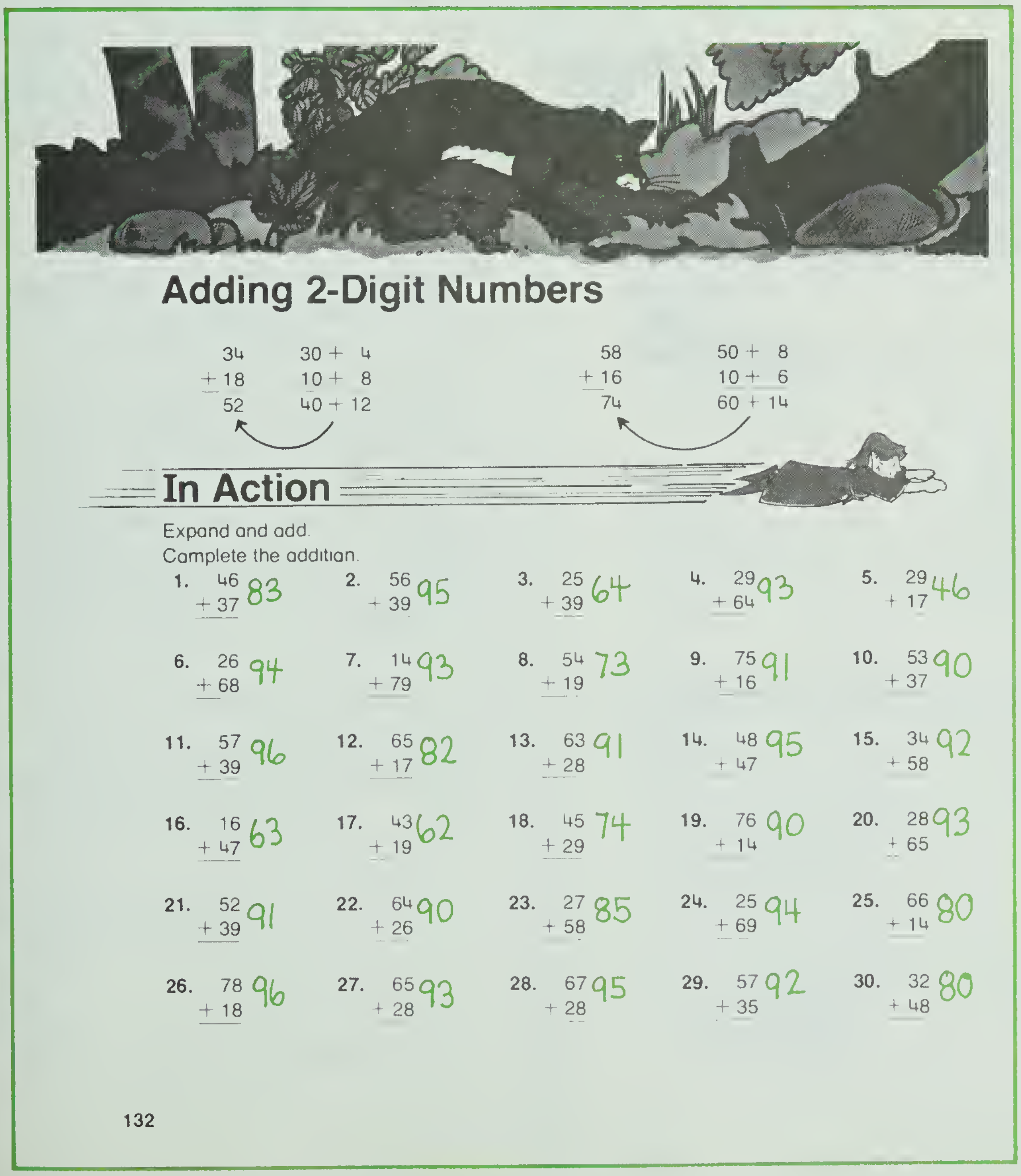
☐ ☐

Make a copy of Program Master 22, cut in half to show the numerals to 50. Have the children draw a square box to enclose four numerals, then add the numbers that are diagonal to each other.

24	25
34	35

59 59

Since the sums must be equal, the children can easily check their answers. Have the children repeat the activity, enclosing 10 other sets of four numerals in squares. The squares can overlap.



Adding 2-Digit Numbers

$$\begin{array}{r} 34 \\ +18 \\ \hline 52 \end{array} \quad \begin{array}{r} 30 + 4 \\ 10 + 8 \\ \hline 40 + 12 \end{array} \qquad \begin{array}{r} 58 \\ +16 \\ \hline 74 \end{array} \quad \begin{array}{r} 50 + 8 \\ 10 + 6 \\ \hline 60 + 14 \end{array}$$

In Action

Expand and add.
Complete the addition.

1. 46 + 37 83
2. 56 + 39 95
3. 25 + 39 64
4. 29 + 64 93
5. 29 + 17 46
6. 26 + 68 94
7. 14 + 79 93
8. 54 + 19 73
9. 75 + 16 91
10. 53 + 37 90
11. 57 + 39 96
12. 65 + 17 82
13. 63 + 28 91
14. 48 + 47 95
15. 34 + 58 92
16. 16 + 47 63
17. 43 + 19 62
18. 45 + 29 74
19. 76 + 14 90
20. 28 + 65 93
21. 52 + 39 91
22. 64 + 26 90
23. 27 + 58 85
24. 25 + 69 94
25. 66 + 14 80
26. 78 + 18 96
27. 65 + 28 93
28. 67 + 28 95
29. 57 + 35 92
30. 32 + 48 80

Unit 2 Section 7 Lesson 3

Adding Two-Digit Numbers: Regrouping, No Regrouping

Materials

- for each group
  - deck of addition-question cards

Lesson

1

Gather the children around the easel. Write questions such as the following:

32 40 28 20 34 15
+58 +46 +39 +60 +29 +71

Have children expand the addends, add the tens and ones to get an expanded sum, exchange 1 ten for 10 ones if necessary, then write the sum. Have each child explain each exchange.

2

Write the addition questions used in step 1 on the easel. Tell the children that they are going to complete them without expanding the numerals. Then, using an example, demonstrate the procedure and fill in the numerals under the question.

23
+58

Looking at 8 and 3, I think 11. I write 1.

Looking at 5 and 2, I think 6, 8. I write 8 in the tens place.

Discuss the process. Then have children try it.

3

Have children use the easel to write addition questions that they find difficult. Each child who writes a question appoints another group member to complete the question. Encourage each participant to explain each exchange of tens and ones.

Written and Other Activities

☐

mathways 3, page 133

Before assigning the page, invite children to think of real-life situations for several of the addition questions.

First, 38 cars passed the school.
Then 42 cars passed the school.
How many cars passed the school?

Develop word problems to accompany the questions, writing them on the easel.

☐ ☐

Have the children check a number of the addition questions on page 133 by changing the order of the addends:

38 42
+42 +38
80 80

☐ ☐ ☐

Write addition questions on cards. Include some questions that do not require an exchange of tens and ones. Groups of four players use the deck to play the following game:

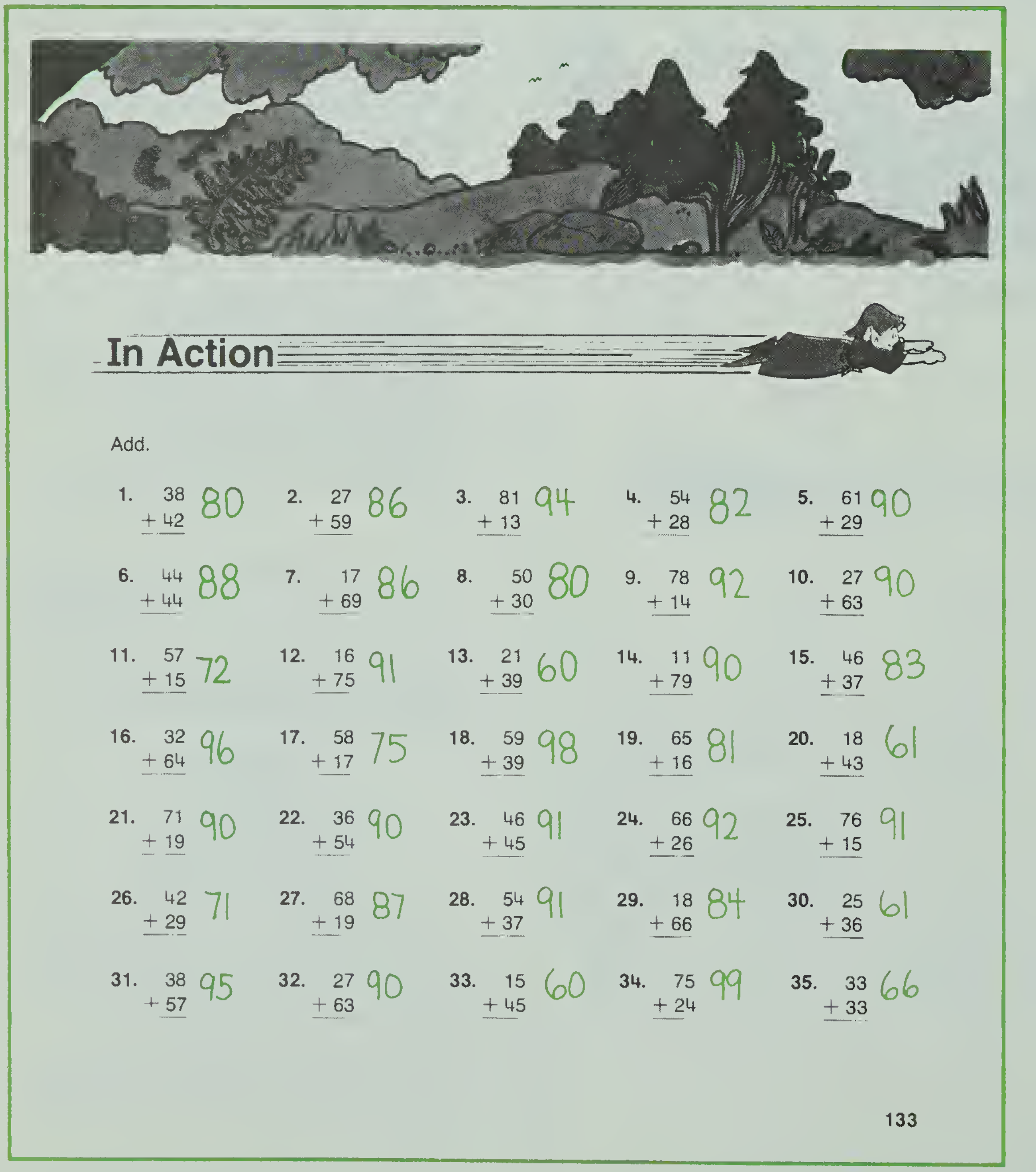
A leader draws a card and shows it to the group. The first child to say *Exchange* or *Don't exchange* keeps the card. The player who has the greatest number of cards when all the cards have been drawn is the winner. The winner becomes the next leader. Children can use the cards to provide questions for extra practice.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 28

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 39 and 40



In Action

Add.

1. 38 + 42 80
2. 27 + 59 86
3. 81 + 13 94
4. 54 + 28 82
5. 61 + 29 90
6. 44 + 44 88
7. 17 + 69 86
8. 50 + 30 80
9. 78 + 14 92
10. 27 + 63 90
11. 57 + 15 72
12. 16 + 75 91
13. 21 + 39 60
14. 11 + 79 90
15. 46 + 37 83
16. 32 + 64 96
17. 58 + 17 75
18. 59 + 39 98
19. 65 + 16 81
20. 18 + 43 61
21. 71 + 19 90
22. 36 + 54 90
23. 46 + 45 91
24. 66 + 26 92
25. 76 + 15 91
26. 42 + 29 71
27. 68 + 19 87
28. 54 + 37 91
29. 18 + 66 84
30. 25 + 36 61
31. 38 + 57 95
32. 27 + 63 90
33. 15 + 45 60
34. 75 + 24 99
35. 33 + 33 66

133

Unit 2 Section 7 Lesson 4
Subtracting a Two-Digit Number from a Two-Digit Number: Regrouping

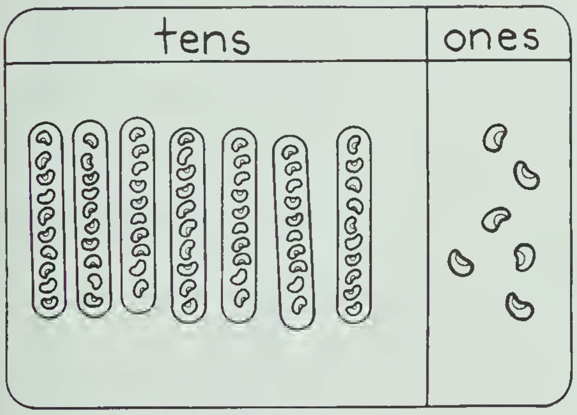
Materials
- for each child
  - place-value material and mat
  - 10-strips and unit strips: Program Masters 19 and 20

Lesson
1

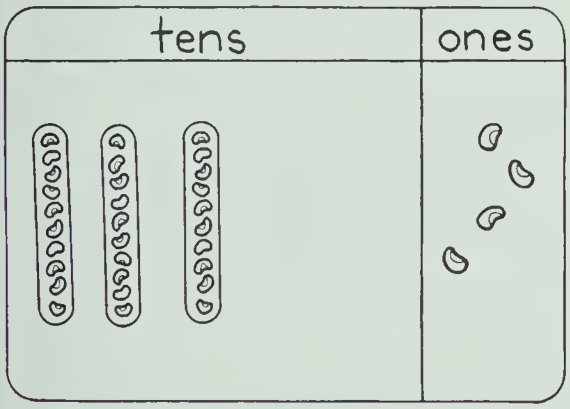
Seat the children around the working area. Distribute place-value material and mats. Write on the easel

$\begin{array}{r}76\\-42\\\hline\end{array}$

Have the children show the minuend on their mats.



Then have them show the subtraction of the subtrahend.



Have a child write the difference on the easel, using expanded form.

30 + 4

Have another child write the answer under the question.

$\begin{array}{r}76\\-42\\\hline 34\end{array}$

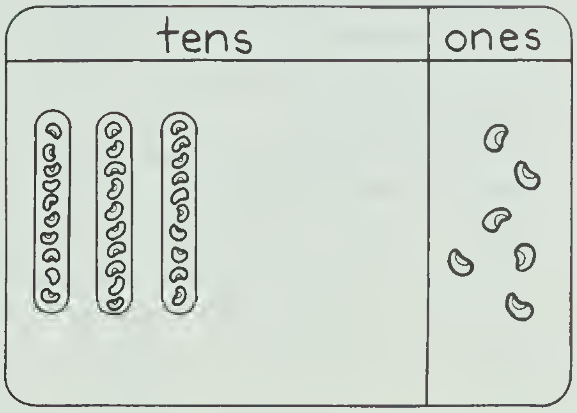
Repeat, using other examples that do not require exchanges of tens and ones. Include questions such as

$\begin{array}{r}90\\-40\\\hline\end{array}$ $\begin{array}{r}36\\-20\\\hline\end{array}$

2

Write on the easel

$\begin{array}{r}36\\-18\\\hline\end{array}$

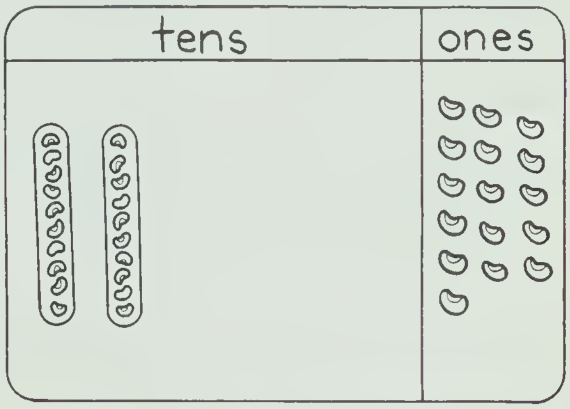


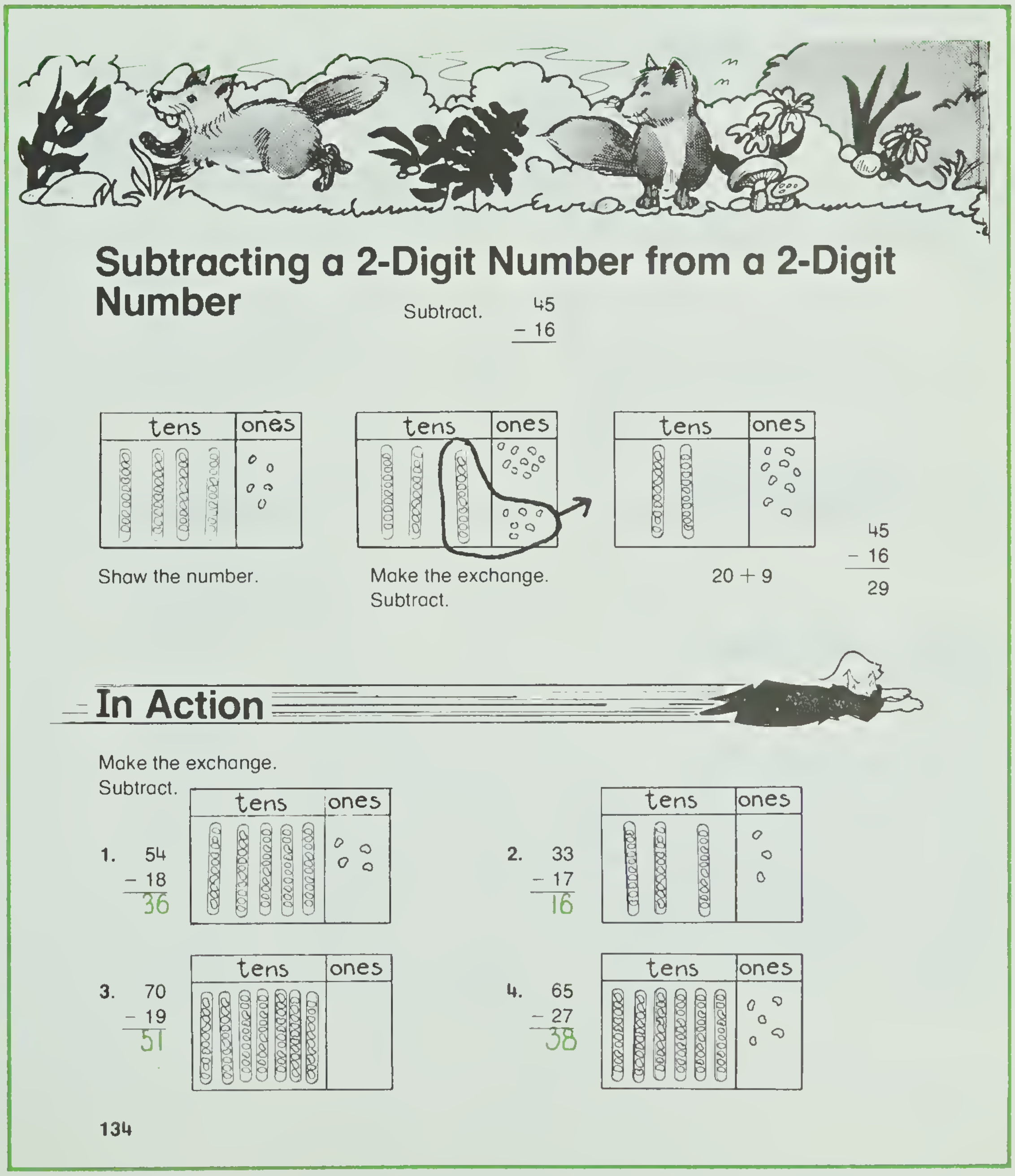
Have the children represent the minuend on their place-value mats.

Ask

How can we subtract the ones?

Discuss exchanging 1 ten and 10 ones. Have the children show the exchange, rearranging material on their mats.





Subtracting a 2-Digit Number from a 2-Digit Number

Subtract. $\begin{array}{r}45\\-16\\\hline\end{array}$

Show the number.

Make the exchange.
Subtract.

20 + 9

$\begin{array}{r}45\\-16\\\hline 29\end{array}$

In Action

Make the exchange.
Subtract.

1. $\begin{array}{r}54\\-18\\\hline 36\end{array}$

2. $\begin{array}{r}33\\-17\\\hline 16\end{array}$

3. $\begin{array}{r}70\\-19\\\hline 51\end{array}$

4. $\begin{array}{r}65\\-27\\\hline 38\end{array}$

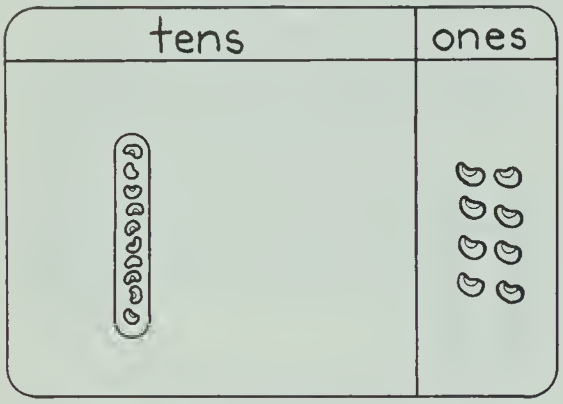
134

Ask

Now, can we subtract 8 ones from 16 ones?

Have the children show the subtraction on their mats. Have a child record the result on the easel.

10 + 8



Record the answer under the subtraction question.

$$\begin{array}{r} 36 \\ -18 \\ \hline 18 \end{array}$$

Repeat.

3

Write the following questions on the easel:

$$\begin{array}{rrrrrr} 68 & 72 & 35 & 90 & 40 & 81 \\ -53 & -17 & -20 & -50 & -23 & -34 \\ \hline \end{array}$$

Have children identify those that do not require an exchange of tens and ones. Then have volunteers complete the questions without using place-value material to keep track of the process.

Written and Other Activities

☐

mathways 3, page 134

Have children explain each step of the question illustrated at the top of the page. Have the children illustrate the steps with place-value material on their mats. Assign the In Action questions.

☐ ☐

Review the relationship between addition and subtraction. Have the children use addition to check some of the questions on page 134 of their texts.

☐ ☐ ☐

Have the children illustrate a subtraction question in each of the following ways:

- on a place-value chart
- on a number line
- by gluing 10-strips and unit strips onto a place-value mat

For Your Notes

Unit 2 Section 7 Lesson 5

Subtracting a Two-Digit Number from a Two-Digit Number: Expanded Numerals

Rationale

This lesson is designed to prepare children for subtracting without the aid of concrete materials. Here the children are asked to go through a mental progression of steps:

- think of the expanded form of the minuend after exchanging 1 ten for 10 ones
- think of the expanded form of the subtrahend
- subtract to arrive at the expanded form of the difference
- convert the expanded difference into a standard numeral

For example

Subtract.

$$\begin{array}{rcrcr} 71 & & 60 & + & 11 \\ -28 & \text{or} & 20 & + & 8 \\ \cline{1-1}\cline{3-5} 43 & & 40 & + & 3 \end{array}$$

Lesson

1

Gather the children around the easel. Write

$$\begin{array}{r} 48 \\ -19 \\ \hline \end{array}$$

Ask

Is it necessary to exchange 1 ten for 10 ones to complete this question? Why?

A child responds

Because you can't take 9 ones away from 8 ones.

Ask

Can you tell me another way of writing 48 that would help me to subtract?

Have the child who responds record

Subtract.

$$\begin{array}{rcr} 30 & + & 18 \\ 10 & + & 9 \\ \hline \end{array}$$

Have the child subtract the ones and tens columns and fill in the sum under the subtraction question.

$$\begin{array}{r} 48 \\ -19 \\ \hline 29 \end{array}$$

Repeat, giving several children an opportunity to participate. Include some minuends that have zero ones and subtrahends that result in zero tens. For example

$$\begin{array}{rr} 40 & 72 \\ -22 & -64 \\ \hline \end{array}$$

Written and Other Activities

mathways 3, page 135

Before assigning the page, have children describe the development of the examples.

☐

Recall the use of addition for checking subtraction questions. Have the children add to check their answers to several questions on page 135.

☐ ☐

To help children develop the ability to judge when an exchange is necessary, and to develop their ability to subtract without making an exchange, assign the following questions:

1.	2.	3.
$\begin{array}{r} 88 \\ -66 \\ \hline \end{array}$	$\begin{array}{r} 91 \\ -53 \\ \hline \end{array}$	$\begin{array}{r} 72 \\ -19 \\ \hline \end{array}$
4.	**5.**	**6.**
$\begin{array}{r} 80 \\ -65 \\ \hline \end{array}$	$\begin{array}{r} 47 \\ -17 \\ \hline \end{array}$	$\begin{array}{r} 68 \\ -59 \\ \hline \end{array}$
7.	**8.**	**9.**
$\begin{array}{r} 73 \\ -66 \\ \hline \end{array}$	$\begin{array}{r} 60 \\ -20 \\ \hline \end{array}$	$\begin{array}{r} 95 \\ -42 \\ \hline \end{array}$
10.	**11.**	**12.**
$\begin{array}{r} 54 \\ -30 \\ \hline \end{array}$	$\begin{array}{r} 85 \\ -36 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ -23 \\ \hline \end{array}$
13.	**14.**	**15.**
$\begin{array}{r} 29 \\ -21 \\ \hline \end{array}$	$\begin{array}{r} 64 \\ -17 \\ \hline \end{array}$	$\begin{array}{r} 70 \\ -28 \\ \hline \end{array}$

☐ ☐ ☐

mathways 3 Practice Masters page 29

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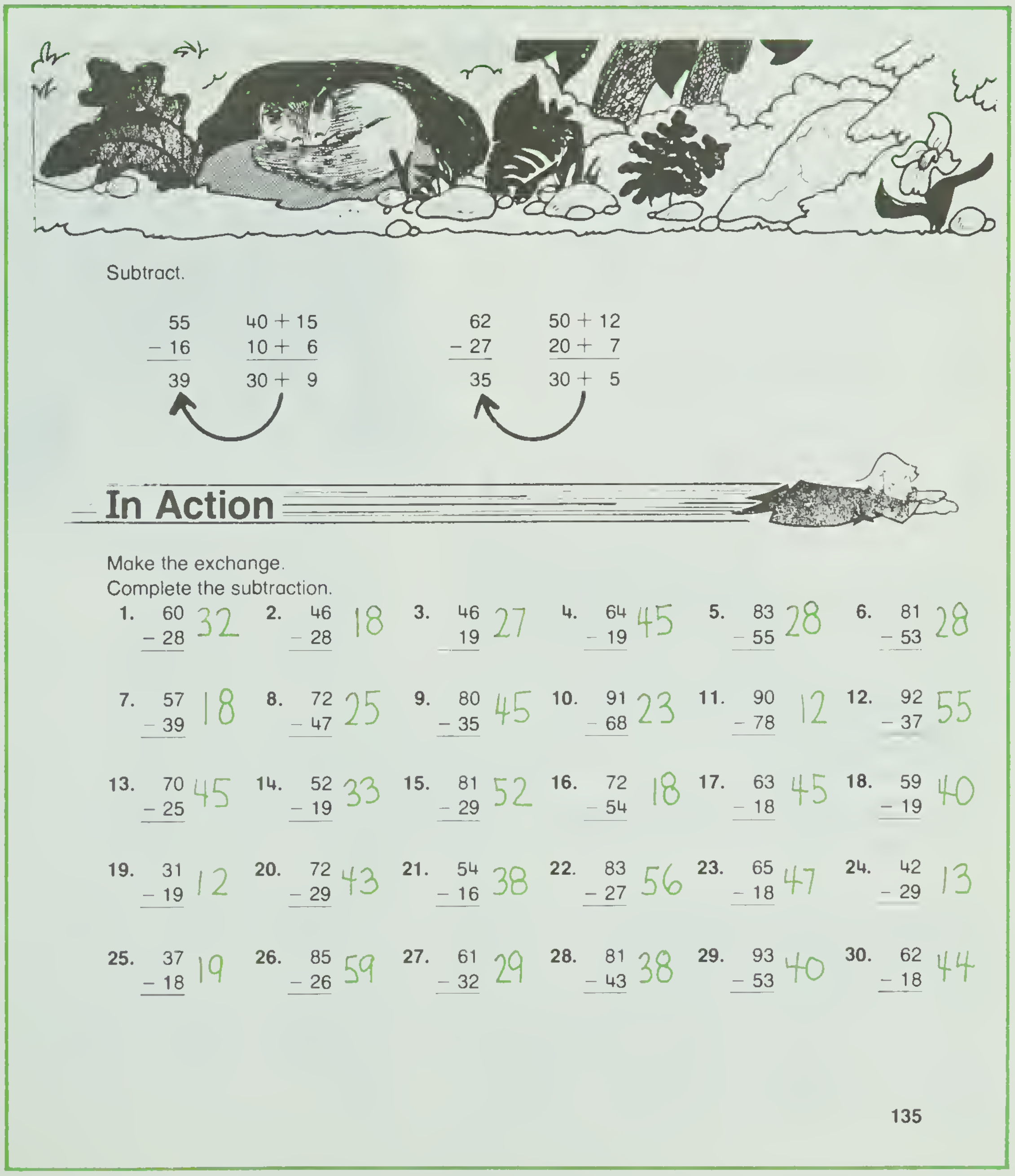
mathways 3 Plus Workbook pages 41 and 42



Subtract.

$$\begin{array}{rcrcr} 55 & & 40 & + & 15 \\ -\ 16 & & 10 & + & 6 \\ \cline{1-1}\cline{3-5} 39 & & 30 & + & 9 \end{array} \qquad \begin{array}{rcrcr} 62 & & 50 & + & 12 \\ -\ 27 & & 20 & + & 7 \\ \cline{1-1}\cline{3-5} 35 & & 30 & + & 5 \end{array}$$

In Action

Make the exchange.
Complete the subtraction.

1.		2.		3.		4.		5.		6.	
$\begin{array}{r} 60 \\ -\ 28 \\ \hline \end{array}$	32	$\begin{array}{r} 46 \\ -\ 28 \\ \hline \end{array}$	18	$\begin{array}{r} 46 \\ 19 \\ \hline \end{array}$	27	$\begin{array}{r} 64 \\ -\ 19 \\ \hline \end{array}$	45	$\begin{array}{r} 83 \\ -\ 55 \\ \hline \end{array}$	28	$\begin{array}{r} 81 \\ -\ 53 \\ \hline \end{array}$	28
7.		**8.**		**9.**		**10.**		**11.**		**12.**	
$\begin{array}{r} 57 \\ -\ 39 \\ \hline \end{array}$	18	$\begin{array}{r} 72 \\ -\ 47 \\ \hline \end{array}$	25	$\begin{array}{r} 80 \\ -\ 35 \\ \hline \end{array}$	45	$\begin{array}{r} 91 \\ -\ 68 \\ \hline \end{array}$	23	$\begin{array}{r} 90 \\ -\ 78 \\ \hline \end{array}$	12	$\begin{array}{r} 92 \\ -\ 37 \\ \hline \end{array}$	55
13.		**14.**		**15.**		**16.**		**17.**		**18.**	
$\begin{array}{r} 70 \\ -\ 25 \\ \hline \end{array}$	45	$\begin{array}{r} 52 \\ -\ 19 \\ \hline \end{array}$	33	$\begin{array}{r} 81 \\ -\ 29 \\ \hline \end{array}$	52	$\begin{array}{r} 72 \\ -\ 54 \\ \hline \end{array}$	18	$\begin{array}{r} 63 \\ -\ 18 \\ \hline \end{array}$	45	$\begin{array}{r} 59 \\ -\ 19 \\ \hline \end{array}$	40
19.		**20.**		**21.**		**22.**		**23.**		**24.**	
$\begin{array}{r} 31 \\ -\ 19 \\ \hline \end{array}$	12	$\begin{array}{r} 72 \\ -\ 29 \\ \hline \end{array}$	43	$\begin{array}{r} 54 \\ -\ 16 \\ \hline \end{array}$	38	$\begin{array}{r} 83 \\ -\ 27 \\ \hline \end{array}$	56	$\begin{array}{r} 65 \\ -\ 18 \\ \hline \end{array}$	47	$\begin{array}{r} 42 \\ -\ 29 \\ \hline \end{array}$	13
25.		**26.**		**27.**		**28.**		**29.**		**30.**	
$\begin{array}{r} 37 \\ -\ 18 \\ \hline \end{array}$	19	$\begin{array}{r} 85 \\ -\ 26 \\ \hline \end{array}$	59	$\begin{array}{r} 61 \\ -\ 32 \\ \hline \end{array}$	29	$\begin{array}{r} 81 \\ -\ 43 \\ \hline \end{array}$	38	$\begin{array}{r} 93 \\ -\ 53 \\ \hline \end{array}$	40	$\begin{array}{r} 62 \\ -\ 18 \\ \hline \end{array}$	44

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Unit 2 Section 7 Lesson 6

Byway: Finding the Missing Numbers in Addition and Subtraction Questions

PROBLEM SOLVING

Rationale

Byway pages are designed to provide a bit of challenging fun by giving children puzzles to solve. Finding the missing numbers in subtraction and addition questions, such as those that follow, helps children to see the inverse relationship between the two algorithms in a context of discovery.

Lesson

1

Write an addition or subtraction question that does not require making an exchange on the easel. For example

23
+35

Have a child complete it. Discuss whether the result would have been the same had the addends been reversed. Then write

23
+□□
58

Have a volunteer complete it and explain the relationship between the two questions. Continue, substituting the following:

□□	58	58	□□
+35	−2□	−□5	−23
58	35	23	35

23	58	□□
+3□	−□3	−35
□8	3□	28

2

Write questions, such as the following, that require an exchange of tens and ones. Have a volunteer complete each and explain its relationship to the previous question(s).

48	48	64	□□	64	6□
+16	+□□	−□□	+16	−□8	−□6
□□	64	48	64	16	48

3

Have the children complete the following questions, which do not involve exchanges, on the easel:

□□	25	□1	56	□□	8□
+12	+□□	+7□	−□□	−42	−□1
38	59	91	20	33	65

4

Have the children complete the following questions requiring exchanges on the easel:

49	□□	□□	2□	90	□8
+□□	−36	+45	+□5	−□□	−2□
88	45	61	70	16	56

Written and Other Activities

☐

mathways 3, page 136

Before assigning the page, have children use place-value materials to demonstrate a few of the questions.

☐ ☐

Children who have difficulty with the questions on page 136 can be given alternative questions, which do not involve exchanges.

Add.

1.	2.	3.
12	□□	6□
+□□	+31	+2□
53	61	48

4.	5.	6.
3□	4□	□□
+□7	+50	+41
87	96	79

7.	8.	9.
4	22	23
+1□	+□7	+□□
18	59	75

Subtract.

10.	11.	12.
69	□□	28
−□9	−32	−□□
30	42	18

13.	14.	15.
5□	86	□9
−□0	−□□	−2□
21	14	54

Byway

Find the missing numbers.

Add.

1.	2.	3.	4.
22	47	74	47
+ 58	+ 48	+ 19	+ 38
80	95	93	85

Subtract.

5.	6.	7.	8.
63	75	36	38
− 47	− 36	− 19	− 21
16	39	17	17

Add.

9.	10.	11.	12.	13.	14.
62	26	27	59	35	24
+ 29	+ 26	+ 18	+ 24	+ 39	+ 37
91	52	45	83	74	61

Subtract.

15.	16.	17.	18.	19.	20.
46	34	74	87	23	35
− 27	− 7	− 38	− 19	− 18	− 17
19	27	36	68	05	18

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Unit 2 Section 7 Lesson 7

Recalling Place Value, Number Patterns, Counting, Comparing Numbers, Adding and Subtracting

Materials

- for each child
  - place-value material and mat

Lesson

1

Review each of the skills required to complete the exercises.
If the children have difficulty completing particular portions of page 137, select activities from lessons designed for other pages in Section 7 to reinforce concepts and skills.

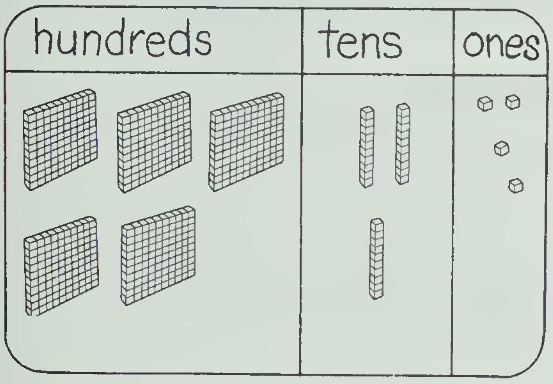
Written and Other Activities

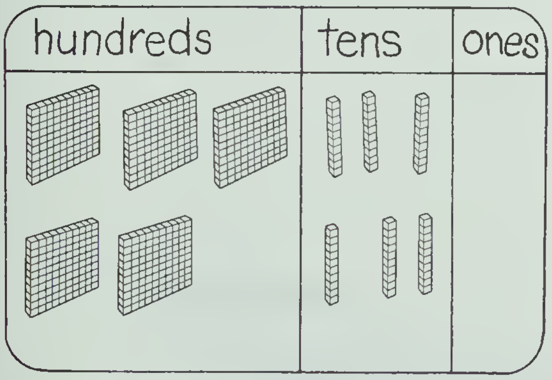
☐

mathways 3, page 137

☐ ☐

Have the children use place-value materials to show the comparisons required for questions 29 to 36.
For example, for question **29**:



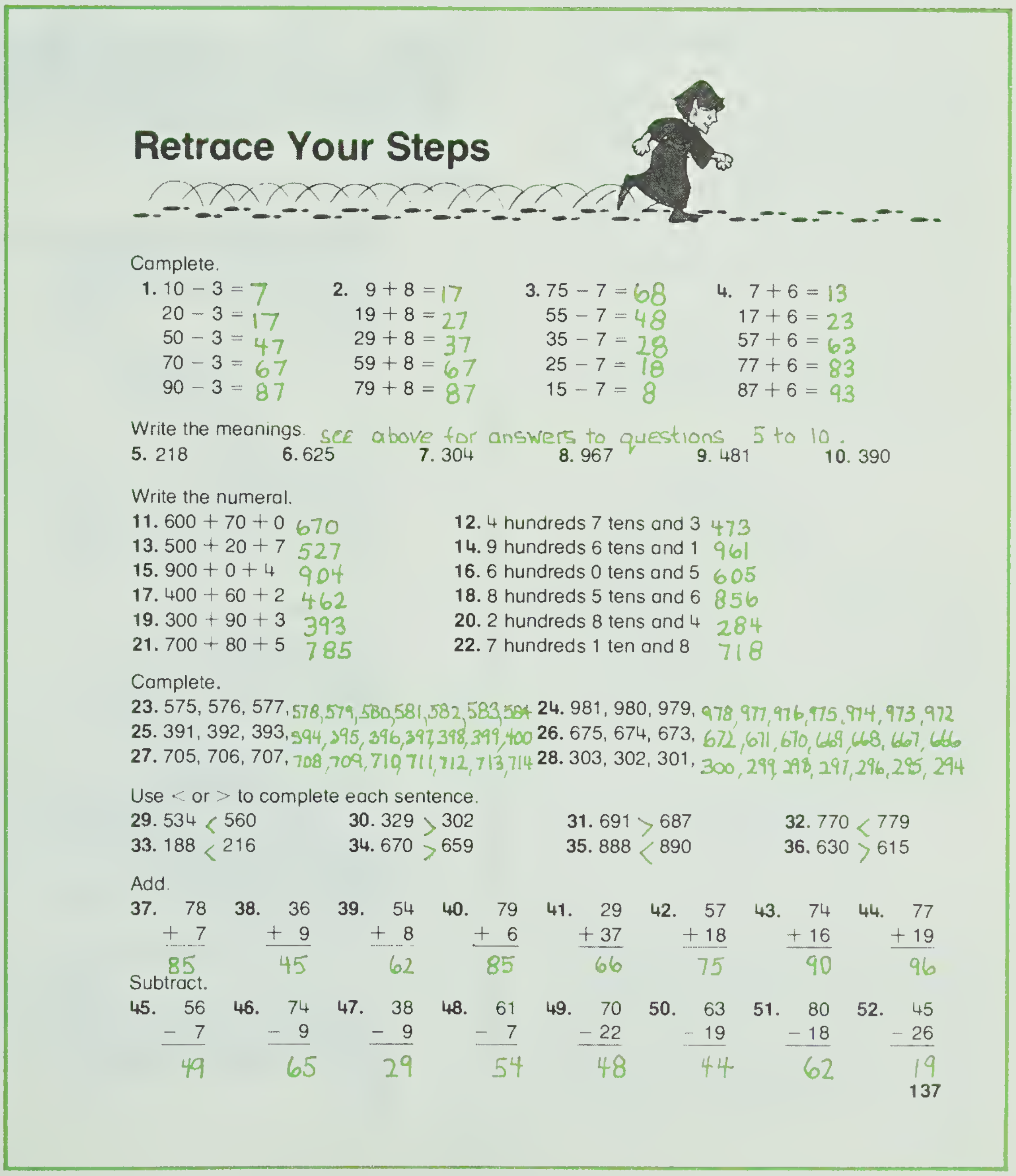


534<560

Additional Answers

5. 2 hundreds 1 ten and 8
6. 6 hundreds 2 tens and 5
7. 3 hundreds 0 tens and 4
8. 9 hundreds 6 tens and 7
9. 4 hundreds 8 tens and 1
10. 3 hundreds 9 tens and 0

For Your Notes



Retrace Your Steps

Complete.

1. 10 − 3 = 7
20 − 3 = 17
50 − 3 = 47
70 − 3 = 67
90 − 3 = 87

2. 9 + 8 = 17
19 + 8 = 27
29 + 8 = 37
59 + 8 = 67
79 + 8 = 87

3. 75 − 7 = 68
55 − 7 = 48
35 − 7 = 28
25 − 7 = 18
15 − 7 = 8

4. 7 + 6 = 13
17 + 6 = 23
57 + 6 = 63
77 + 6 = 83
87 + 6 = 93

Write the meanings. see above for answers to questions 5 to 10.

5. 218 **6.** 625 **7.** 304 **8.** 967 **9.** 481 **10.** 390

Write the numeral.

11. 600 + 70 + 0 670
12. 4 hundreds 7 tens and 3 473
13. 500 + 20 + 7 527
14. 9 hundreds 6 tens and 1 961
15. 900 + 0 + 4 904
16. 6 hundreds 0 tens and 5 605
17. 400 + 60 + 2 462
18. 8 hundreds 5 tens and 6 856
19. 300 + 90 + 3 393
20. 2 hundreds 8 tens and 4 284
21. 700 + 80 + 5 785
22. 7 hundreds 1 ten and 8 718

Complete.

23. 575, 576, 577, 578, 579, 580, 581, 582, 583, 584
24. 981, 980, 979, 978, 977, 976, 975, 974, 973, 972
25. 391, 392, 393, 394, 395, 396, 397, 398, 399, 400
26. 675, 674, 673, 672, 671, 670, 669, 668, 667, 666
27. 705, 706, 707, 708, 709, 710, 711, 712, 713, 714
28. 303, 302, 301, 300, 299, 298, 297, 296, 295, 294

Use < or > to complete each sentence.

29. 534 < 560 **30.** 329 > 302 **31.** 691 > 687 **32.** 770 < 779
33. 188 < 216 **34.** 670 > 659 **35.** 888 < 890 **36.** 630 > 615

Add.

37.	**38.**	**39.**	**40.**	**41.**	**42.**	**43.**	**44.**
78	36	54	79	29	57	74	77
+ 7	+ 9	+ 8	+ 6	+ 37	+ 18	+ 16	+ 19
85	45	62	85	66	75	90	96

Subtract.

45.	**46.**	**47.**	**48.**	**49.**	**50.**	**51.**	**52.**
56	74	38	61	70	63	80	45
− 7	− 9	− 9	− 7	− 22	− 19	− 18	− 26
49	65	29	54	48	44	62	19

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Unit 2 Section 7 Lesson 8

Drawing Pictures of Problems

Materials

- magazine cut-outs for illustrating problems
- large sheet of chart paper with a problem written on it:
  On a class trip, Jesse saw 7 snakes and Vera saw 8 snakes. How many snakes did the children see altogether?
- for each child
  - set of cut-outs to create and illustrate a word problem

Rationale

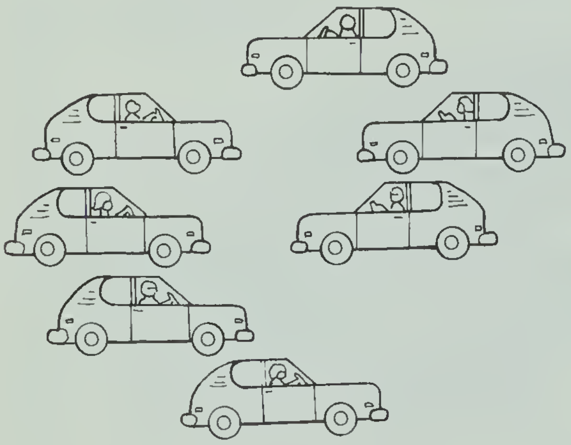
Drawing a picture to illustrate a problem often helps children to understand the numerical information, decide on the appropriate operation and use the information to find the solution.

Lesson

1

Invite the children into the working area. Present a problem while demonstrating it with the cut-outs. For example

Four cars entered the supermarket parking lot.
Then three more cars entered.
How many cars entered the parking lot altogether?

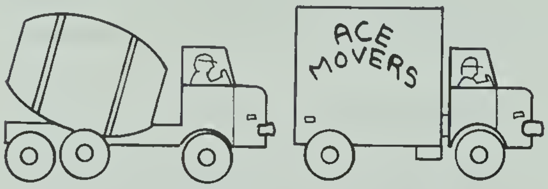


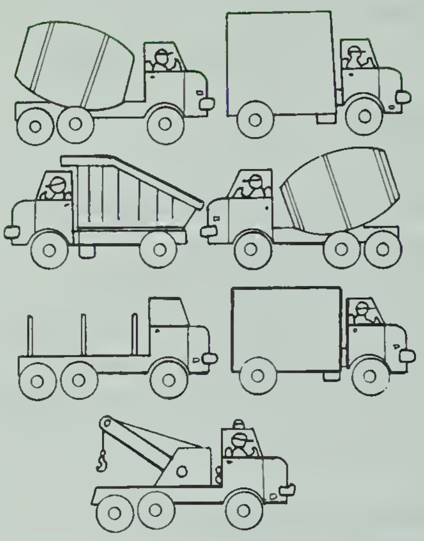
Discuss the operation needed to find the answer. Have a child do the question on the easel. Distribute the cut-outs, giving a set of pictures to each child. Invite the children to create and demonstrate a problem, using the cut-outs.

2

Select one of the problems created by the children. Have a child state the problem and demonstrate it again with the cut-outs. Write the problem on the easel:

2 trucks passed the school. 11
Then, 7 more trucks
passed the school. 1111111
How many trucks
passed the school
altogether?





Invite a child to solve the problem. Repeat, selecting several other problems created by the children.

Drawing Pictures of Problems

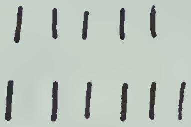
Drawing a picture can sometimes help you understand a problem.

Problem

Picture

One rabbit had a litter of 5 kits.

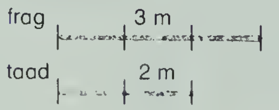
Another rabbit had 6 kits.



How many kits did the 2 rabbits have?

A frog jumped 3 m.

A toad jumped 2 m.



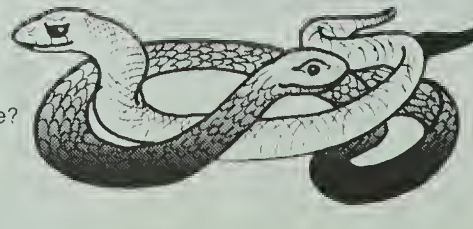
How much further did the frog jump?

In Action

Draw a picture for each problem.
Pictures will vary.

1. One otter caught 3 fish. 8 fish
   Another otter caught 5 fish.
   How many fish did they both catch?

2. A Black Rat snake is about 2 m long.
   A Blue Racer snake is about 1 m long.
   How much longer is the Black Rat snake?
   1 m



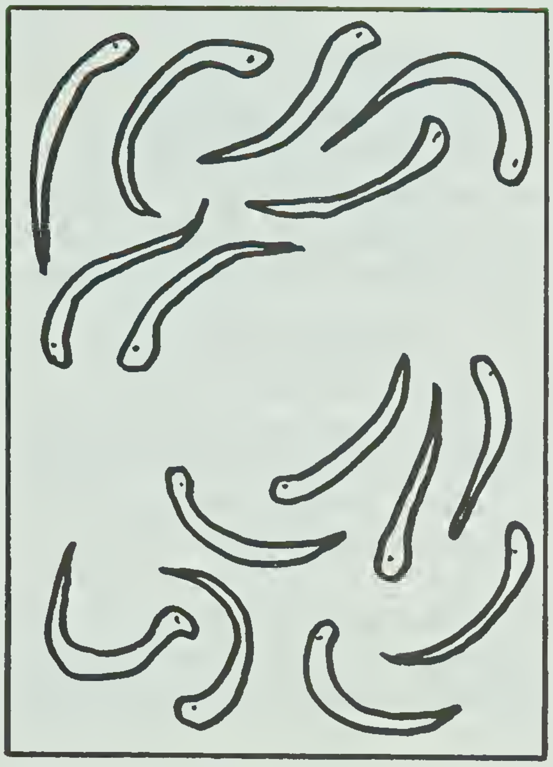
PROBLEM SOLVING

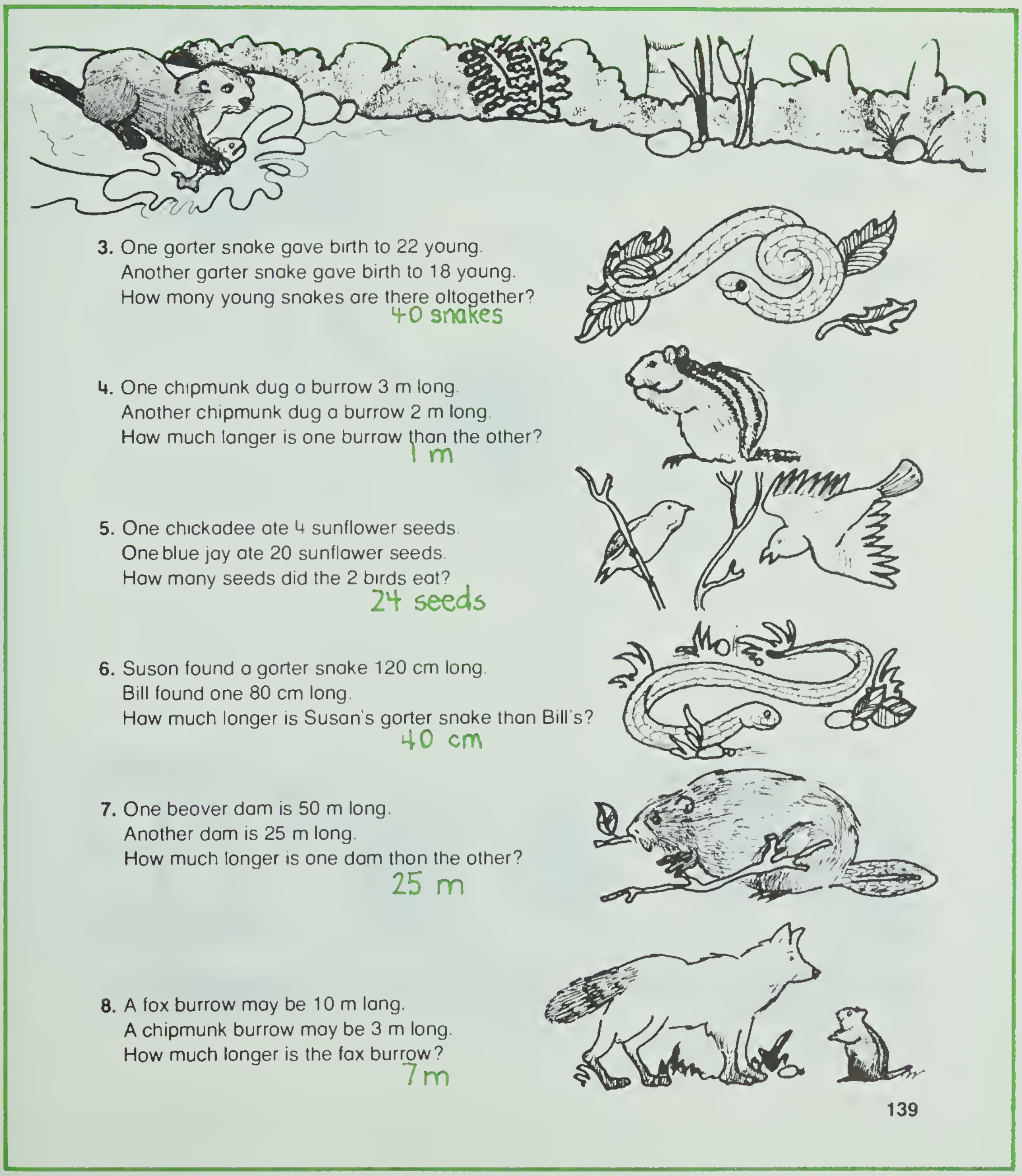
3

Display the chart paper with an addition or subtraction problem written on it. Have a child read the problem and draw a picture on the chart paper that shows the numerical information. Ask the group whether addition or subtraction would be used to find the answer. Invite another child to use the information in the picture to solve the problem and write the answer on the easel. Have the child state the answer in a complete sentence:

The children saw 15 snakes altogether.

Write the sentence beneath the problem on the chart paper.





3. One garter snake gave birth to 22 young.
Another garter snake gave birth to 18 young.
How many young snakes are there altogether?
40 snakes

4. One chipmunk dug a burrow 3 m long.
Another chipmunk dug a burrow 2 m long.
How much longer is one burrow than the other?
1 m

5. One chickadee ate 4 sunflower seeds.
One blue jay ate 20 sunflower seeds.
How many seeds did the 2 birds eat?
24 seeds

6. Susan found a garter snake 120 cm long.
Bill found one 80 cm long.
How much longer is Susan's garter snake than Bill's?
40 cm

7. One beaver dam is 50 m long.
Another dam is 25 m long.
How much longer is one dam than the other?
25 m

8. A fox burrow may be 10 m long.
A chipmunk burrow may be 3 m long.
How much longer is the fox burrow?
7 m

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Written and Other Activities

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mathways 3, pages 138,139

Have the children read the sample problems and tell how the accompanying pictures help to make the information clear. When the examples have been solved, instruct the children to draw a similar picture for each of the In Action problems and write the answer in a complete sentence.

☐ ☐

Invite the children to create other word problems, using the illustrations in their texts to suggest the situations. Have them write the problems in sentences, draw pictures giving the information, and write the answers in complete sentences.

☐ ☐ ☐

mathways 3 Plus Workbook page 43

Unit 2 Section 8 Lesson 1

Exploring the Properties of Squares: Drawing Squares, Comparing Square Regions to Square-Shaped Objects

Materials

- movie *Dance Squared* (National Film Board)
- cubes, several models in a variety of sizes
- for each child
  - collection of familiar square-shaped objects
  - graph paper: Program Master 5
  - dot paper: Program Master 2
  - ruler
  - cubes
  - geoboard
  - elastic bands
  - magazine or catalogue
  - pair of scissors

Rationale

Section 8 is designed to develop the children's awareness of the properties of plane figures. The children may not be able to articulate these properties, but they will begin to appreciate them as a result of an exploration process that includes tracing the faces of three-dimensional models, folding and cutting paper regions, and finding examples of familiar, similarly shaped objects in the environment to discuss and display in the classroom.

Lesson

1

Invite the children into the working area. Have the children point out objects in the classroom that suggest squares. Using a square object to demonstrate, introduce the terms *vertex* and *side*. Explain that these terms are used to describe the faces of three-dimensional objects as well as two-dimensional figures drawn on or cut from paper. Have children point out vertices and sides on objects in the classroom.

2

Distribute the cubes giving one or more to each child. Have the children trace the faces of the cubes and discuss the resulting figures.

3

Provide the children with geoboards and elastic bands. Have them experiment with making squares of various sizes. Encourage the children to compare their squares with those made by other children in the group.

4

Have the children show and describe the squares they made on their geoboards. Then ask several children to tell the meaning of the term *square* in their own words and draw examples on the easel.

5

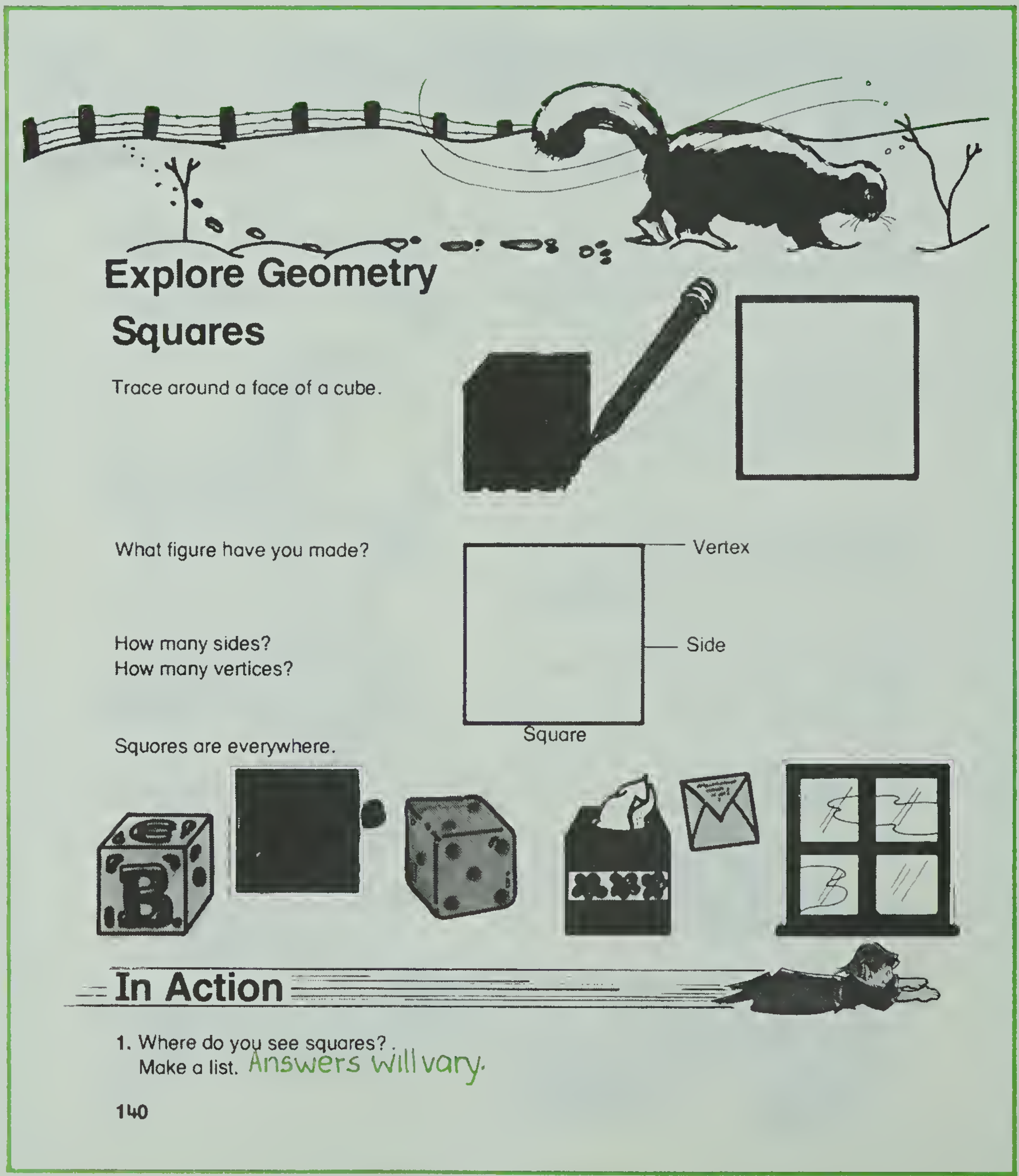
Distribute old magazines. Have each child find and cut out three pictures that show how squares are used. Have the children outline each square in their pictures with coloured pencil or a magic marker. Display the pictures in the geometry centre or have the children glue them in their notebooks.

Written and Other Activities

☐

mathways 3, pages 140, 141

Before assigning the In Action exercises, discuss the illustrations. Then have the children trace the faces of a cube and measure the sides with their rulers. Have children point out the sides, vertices and corners on the figures they have drawn and give an example of where such a figure would



Explore Geometry

Squares

Trace around a face of a cube.

What figure have you made?

How many sides?
How many vertices?

Squares are everywhere.

In Action

1. Where do you see squares? Make a list. Answers will vary.

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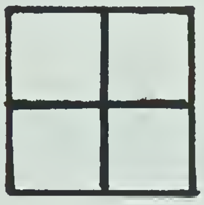
appear in the real world. Then, distribute graph paper, needed for completing exercise 2.

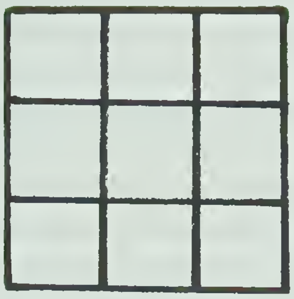
☐ ☐

Show the National Film Board short *Dance Squared*.

☐ ☐ ☐

Show diagrams such as the following and have the children identify and count the squares. For example, in the first diagram there are four small squares and one large square.





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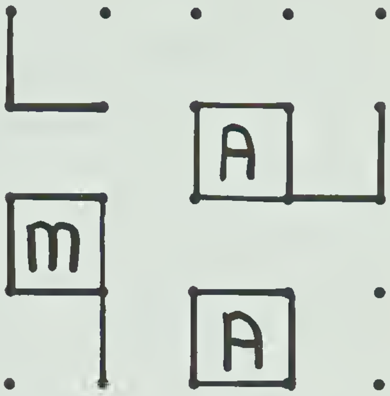
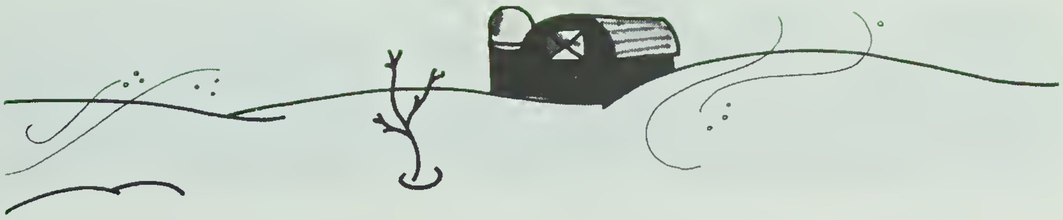
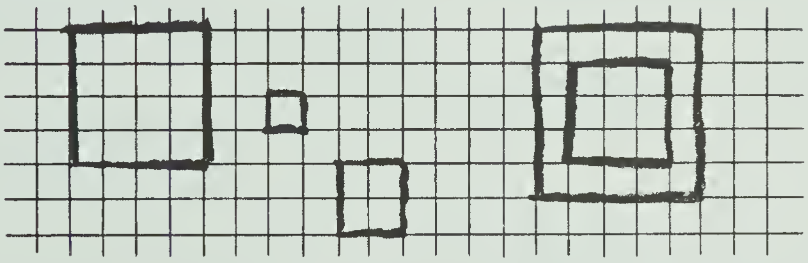
Have pairs of children use a section of dot paper to play a game. Partners take turn joining two adjacent dots by a vertical or horizontal line. The player who draws the last side of a small square initials the square. When all the lines have been drawn, the player whose initial is in the greatest number of squares is the winner. The length of time for playing the game can be varied by the size of the section of dot paper given to the players.

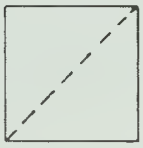




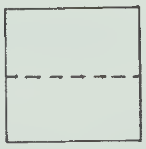
2. Draw some squares on graph paper.
Make some large squares and some small squares.
Draw a small square inside a larger square.



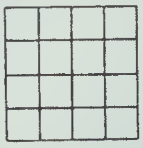
3. Trace around a model of a square and cut it out.
Fold it and cut it in two this way.
What figures have you made? triangles



4. Fold and cut a square in two this way.
What figures have you made? rectangles



5. How many squares do you see?
Answers will vary.
There is a maximum of 30 squares.



Unit 2 Section 8 Lesson 2

Exploring Triangles: Making Triangles, Comparing Triangular Regions to Triangular Objects

Materials

- movie *Notes on a Triangle* (National Film Board)
- cubes in several sizes
- for each child
  - geoboard
  - elastic bands
  - dot paper: Program Master 2
  - isometric grid paper: Program Master 7
  - tracing paper
  - ruler
  - cardboard strips in various lengths with holes punched at 2 cm intervals
  - paper fasteners
  - crayons
  - magazine or catalogue
  - pair of scissors

Lesson

1

Gather the children around the easel. Draw an equilateral, an isosceles and a scalene triangle. Discuss the shared properties of the triangles – for example the number of sides and vertices – and discuss their differences in appearance, in the length of their sides and so on.

2

Distribute geoboards and elastic bands. Have the children experiment with making triangles of various sizes and types. Encourage the children to compare their triangles.

3

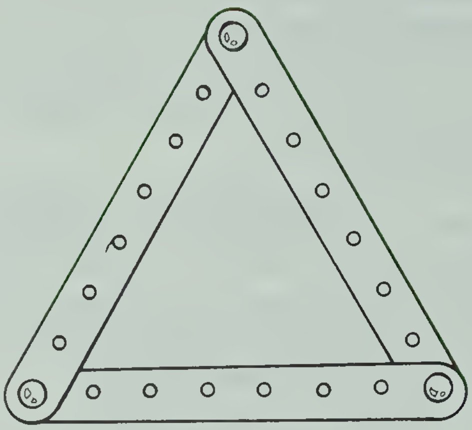
Have the children show the triangles made on their geoboards and describe them in terms of the length of and number of sides, the number of vertices, real-world objects suggested by each and so on. Then ask several children to give a meaning for the term *triangle* in their own words, and draw a triangle on the easel.

4

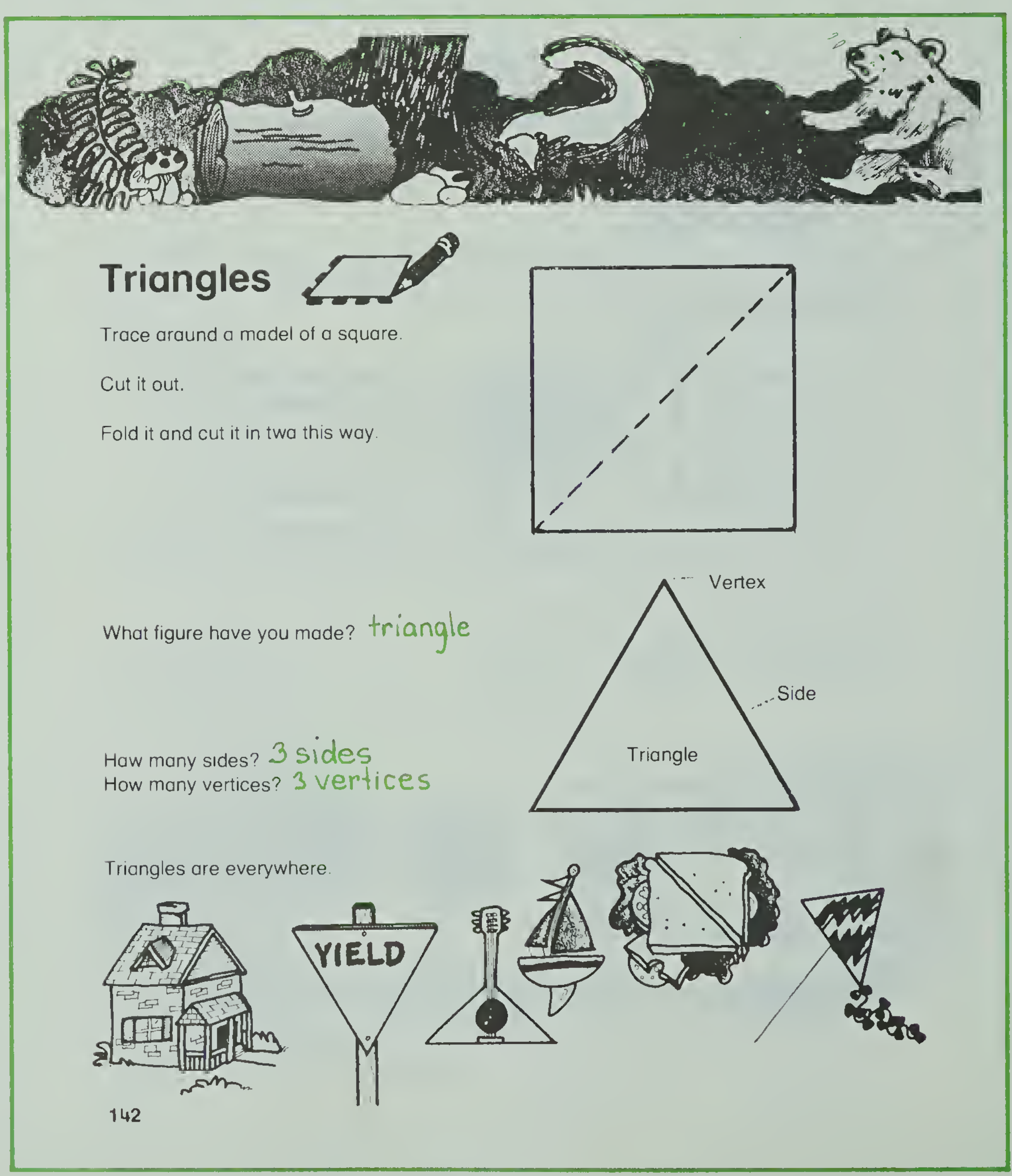
Distribute old magazines. Have the children find and cut out several pictures that show how triangular objects are used. Have them outline each triangle in their pictures, using magic marker or coloured pencil, and show their pictures to the group. Display the pictures in the geometry centre or have the children glue them in their notebooks. Use several of the pictures to initiate a discussion on the ways in which triangles are put to use in the real world.

5

Distribute the paper fasteners and cardboard strips. Instruct the children to make triangles whose sides are of different lengths. The children may discover that all combinations of three strips do not result in triangles. For example, strips 2 cm, 3 cm and 7 cm long cannot make a triangle.



Encourage the children to compare their triangles. Discuss several examples. Display the triangles in the geometry centre.



Triangles

Trace around a model of a square.

Cut it out.

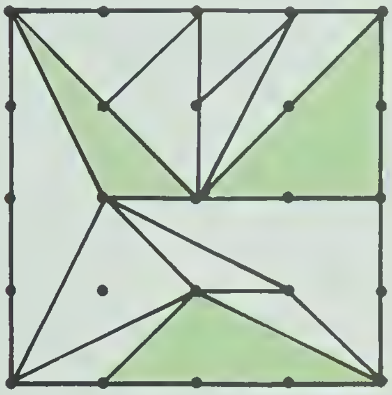
Fold it and cut it in two this way.

What figure have you made? triangle

How many sides? 3 sides
How many vertices? 3 vertices

Triangles are everywhere.

6
Distribute dot paper. Instruct the children to join dots, creating a variety of different triangles. Have them colour their triangles and contribute them to the geometry centre.



Written and Other Activities

☐

mathways 3, pages 142, 143
Have the children trace around a cardboard square or the face of a cube and cut it out as directed. When they have completed their triangles, by cutting the square, discuss a few examples, asking children to point out and describe the sides and vertices. When it has been established that all triangles have the same number of sides and vertices, though the sides are of varying lengths, conduct a discussion of the text statement *Triangles are everywhere.*

After noting the contexts provided in the illustrations at the bottom of page 142, encourage children to suggest other contexts in which triangles appear.

☐ ☐

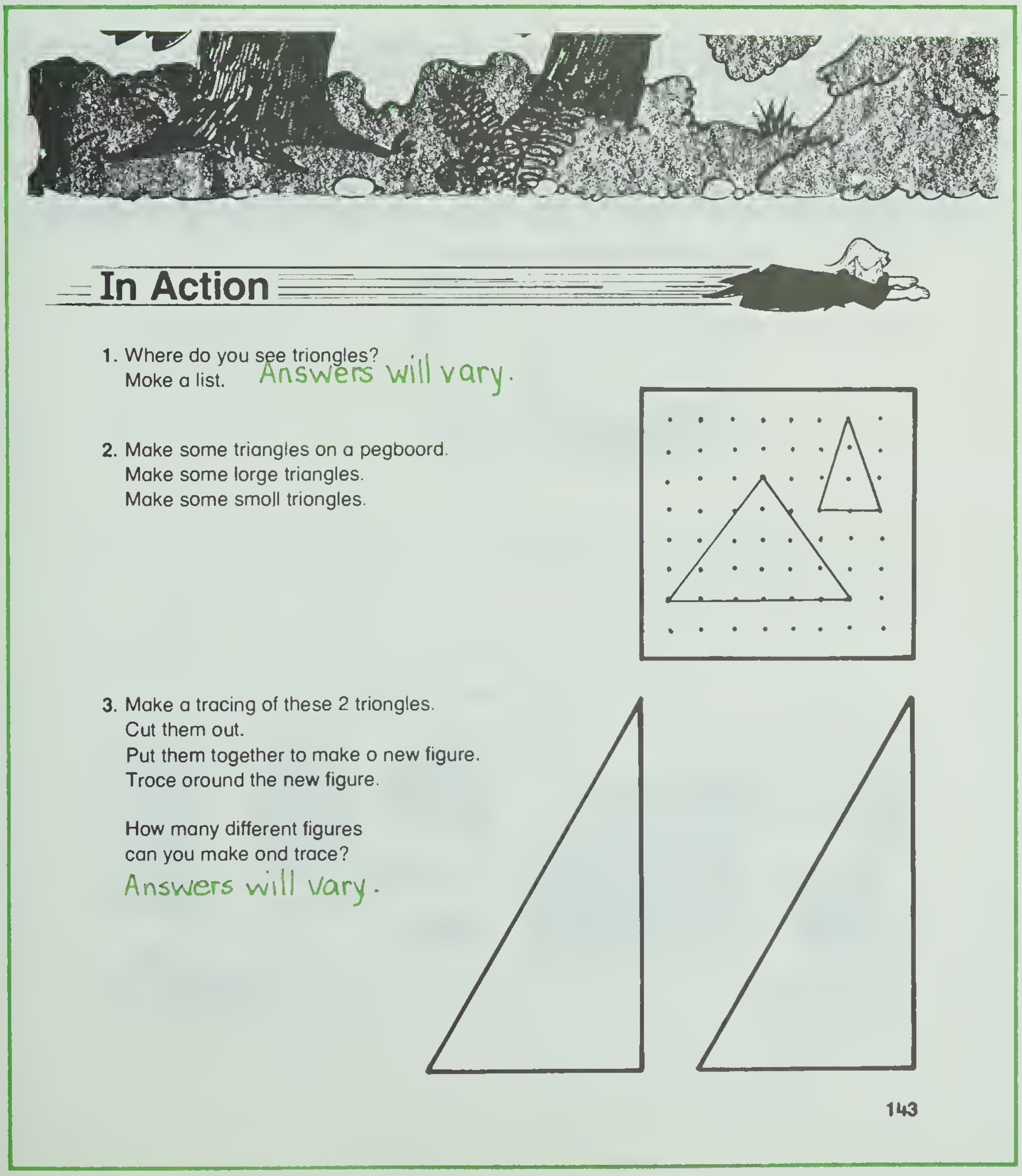
Distribute the triangular grid paper made from Program Master 7. Have the children use the paper to colour patterns of triangles.

☐ ☐ ☐

Distribute dot paper. Have the children draw triangles of various sizes and types by joining dots and cutting them out. Instruct them to fold or combine the triangles in several ways to create other interesting figures. For example, if the corresponding sides of triangles whose sides are of different lengths are matched, the resulting figure may be a rectangle, a parallelogram, a kite or another triangle. Invite the children to glue the triangles onto a sheet of paper in any way they wish and colour them. Display the resulting figures in the geometry centre and discuss several.

☐ ☐ ☐ ☐

Show the movie *Notes on a Triangle.* Encourage children to tell what they found most interesting in the ideas presented.



In Action

1. Where do you see triangles?
   Make a list. Answers will vary.

2. Make some triangles on a pegboard.
   Make some large triangles.
   Make some small triangles.

3. Make a tracing of these 2 triangles.
   Cut them out.
   Put them together to make a new figure.
   Trace around the new figure.

   How many different figures
   can you make and trace?
   Answers will vary.

143

Unit 2 Section 8 Lesson 3

Exploring Rectangles: Making Rectangles, Comparing Rectangular Regions to Rectangular Objects

Materials

- cardboard rectangular regions, a variety of sizes
- rectangular prisms: geometric models, a variety of boxes
- for each child
  - geoboard
  - elastic bands
  - cardboard strips of various lengths with holes punched at 2 cm intervals
  - paper fasteners
  - tracing paper
  - dot paper: Program Master 2
  - ruler
  - construction paper or several manilla tags

Lesson

1

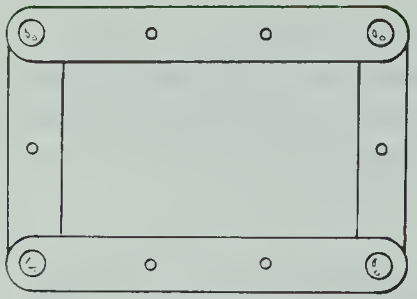
Invite the children into the working area. Place the collection of cardboard rectangular regions in the centre. Allow the children to examine and compare them. Then involve the children in a discussion of the regions' similarities and differences: do they all have the same number of sides and corners? Are their sides equal in length? What accounts for the difference in appearance between the regions? Do the children think that in spite of these differences the regions can share the same name? Introduce the term *rectangle*. Have the children point out objects in the classroom that suggest the rectangular regions. These might include desk and table tops, windows and doors, books and papers.

2

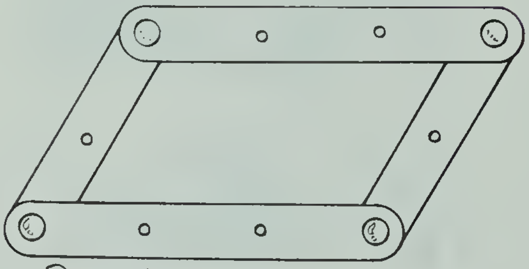
Have a few children describe rectangles in their own words. Have other children draw rectangles on the easel. Invite group members to point out the similarities and differences between the drawings. Compare the drawings to the cardboard regions.

3

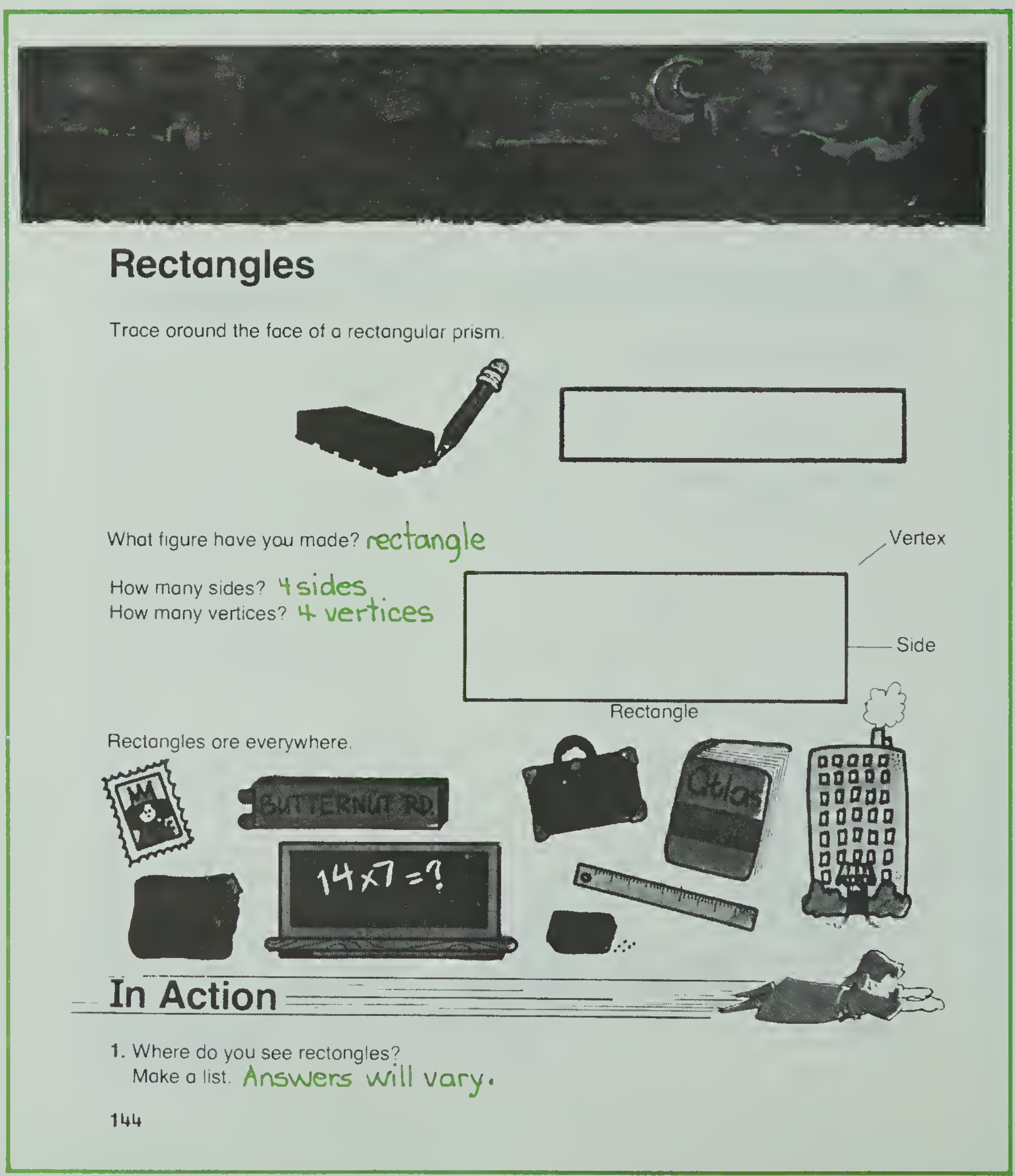
Distribute the cardboard strips and paper fasteners. Have the children use them to construct rectangles. Encourage the children to show, describe and compare their models. In this way they will discover that opposite sides of all rectangles are equal in length and that all the corners are square. Using one of the child-made models to demonstrate, slant the figure to show how a different figure, called a parallelogram, can be created.



Rectangle



Parallelogram



Rectangles

Trace around the face of a rectangular prism.

What figure have you made? rectangle

How many sides? 4 sides

How many vertices? 4 vertices

Vertex

Side

Rectangle

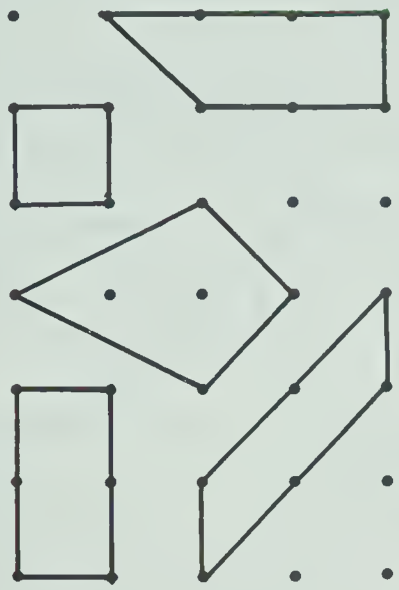
Rectangles are everywhere.

In Action

1. Where do you see rectangles? Make a list. Answers will vary.

144

4
Distribute dot paper.



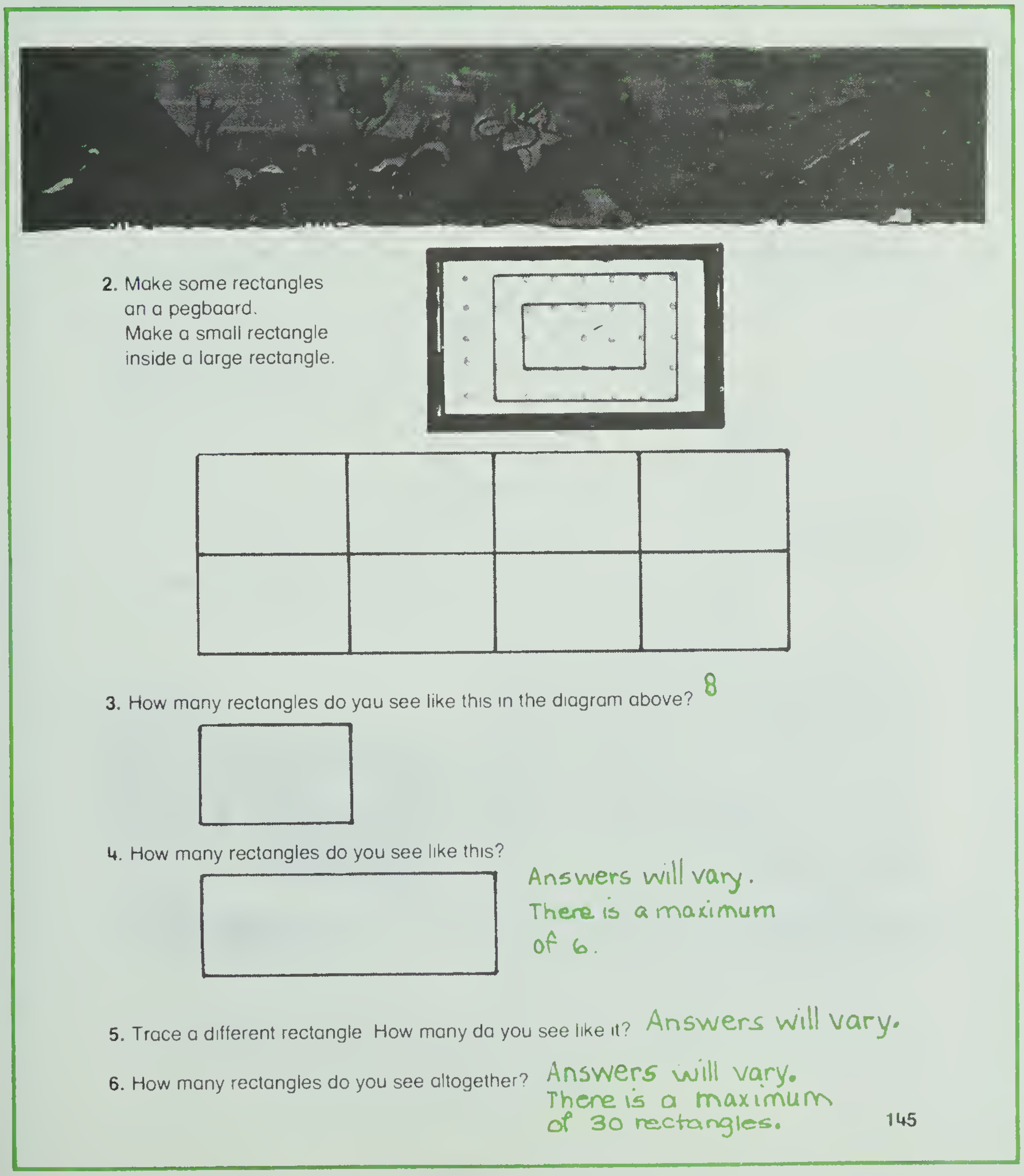
Have the children use rulers to connect dots, creating various quadrilaterals. Encourage experiment. Then have the children cut out the figures and glue them to construction paper or manilla tags. In this way the children become aware that not all four-sided figures are rectangles or squares. The interesting figures can be stored and used later for sorting activities.

5
Show a geometric model of a rectangular prism. Give each child in the group a box. Remind the children of the term *rectangular prism*. Discuss the similarities between the model and the boxes, asking children to count edges and vertices, describe sides and faces and so on. Have each child suggest one object at home that is shaped like the rectangular prism. Have each of the children trace several faces of rectangular prisms. Discuss the resulting figures.

Written and Other Activities

☐
mathways 3, pages 144, 145
Display a rectangular prism, asking *Which sides of this prism are rectangles?*
Distribute models of rectangular prisms or boxes, needed for completing the introductory activity. When the task has been completed and discussed, distribute geoboards, needed for completing exercise 2 of the In Action activities. If geoboards are unavailable, have the children draw figures on dot paper. Encourage the children to compare their rectangles. For exercises 3 to 6, help them to discover as many rectangles as possible.

☐ ☐
Take the children on a walk through the community. Have them locate and sketch places where they see rectangles being used. Back at school, discuss several of the sketches.



2. Make some rectangles on a pegboard.
Make a small rectangle inside a large rectangle.

3. How many rectangles do you see like this in the diagram above? 8

4. How many rectangles do you see like this? Answers will vary. There is a maximum of 6.

5. Trace a different rectangle How many do you see like it? Answers will vary.

6. How many rectangles do you see altogether? Answers will vary. There is a maximum of 30 rectangles.

145

Unit 2 Section 8 Lesson 4

Exploring Hexagons: Making Hexagons, Comparing Hexagonal Figures to Hexagonal Objects

Materials

- regular hexagonal prisms
- regular hexagonal regions of cardboard in several sizes
- for each child
  - triangular grid paper: Program Master 7
  - dot paper: Program Master 4
  - geoboard
  - elastic bands

Lesson

1

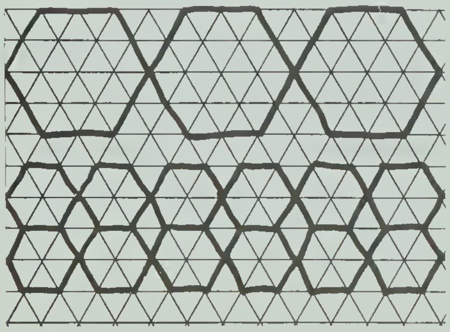
Invite the children into the working area. Place the collection of hexagonal cardboard regions in the centre. Allow the children time to examine and compare them. Ask the children to count the sides and vertices, and select a few children to draw hexagons on the easel, assisting them, if necessary. Introduce the term *hexagon*, writing it on the easel. Discuss with the children the similarities between the figures on the easel and the cardboard regions.

2

Have the children experiment with the cardboard regions, aligning sides to create interesting figures. Then involve the children in a discussion of hexagonal objects in the classroom, at home or in the community.

3

Provide each child with a sheet of triangular grid paper. Have the children colour hexagons to create interesting patterns. Discuss several of the patterns, and display all in the geometry centre.



Written and Other Activities

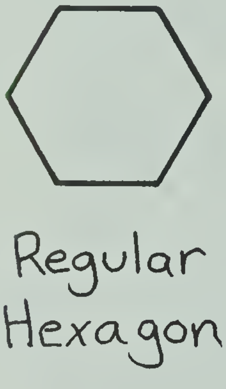
☐

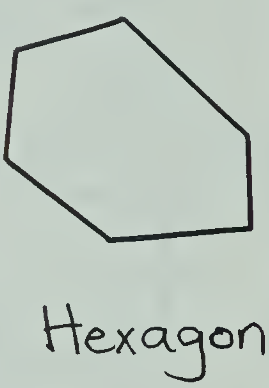
mathways 3, pages 146, 147

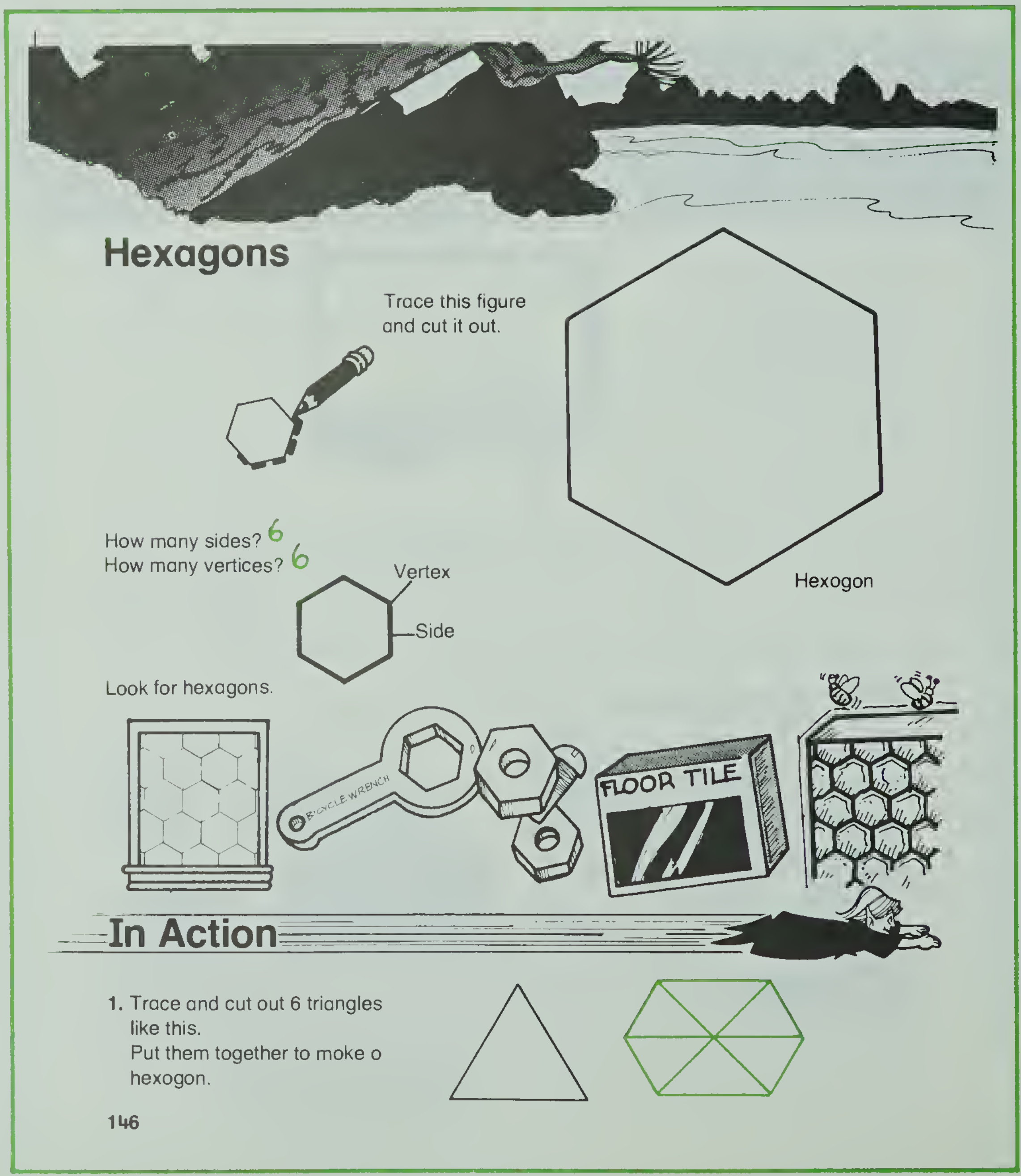
Provide the children with regular hexagonal prisms or cardboard regions, needed for completing the example activity. When the activity has been completed and fully discussed, distribute the geoboards and elastic bands needed for completing exercise 2 of the In Action activities. If geoboards are unavailable, have the children draw hexagons on dot paper. Help the children to find as many hexagons as possible for exercises 3 and 4. When these have been located and traced, have the children colour and cut them out for displaying in the geometry centre. Discuss several of the samples.

☐ ☐

As enrichment, draw and label a regular hexagon and a hexagon on the easel.







Hexagons

Trace this figure and cut it out.

How many sides? 6

How many vertices? 6

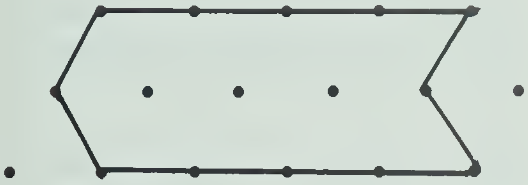
Look for hexagons.

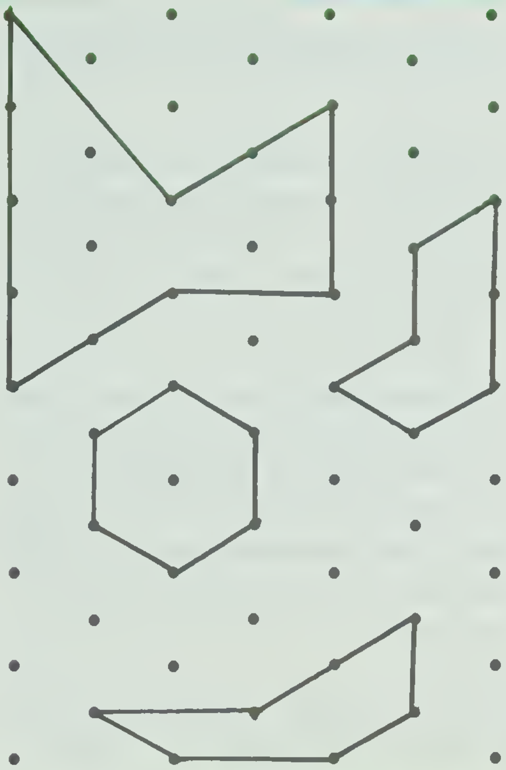
In Action

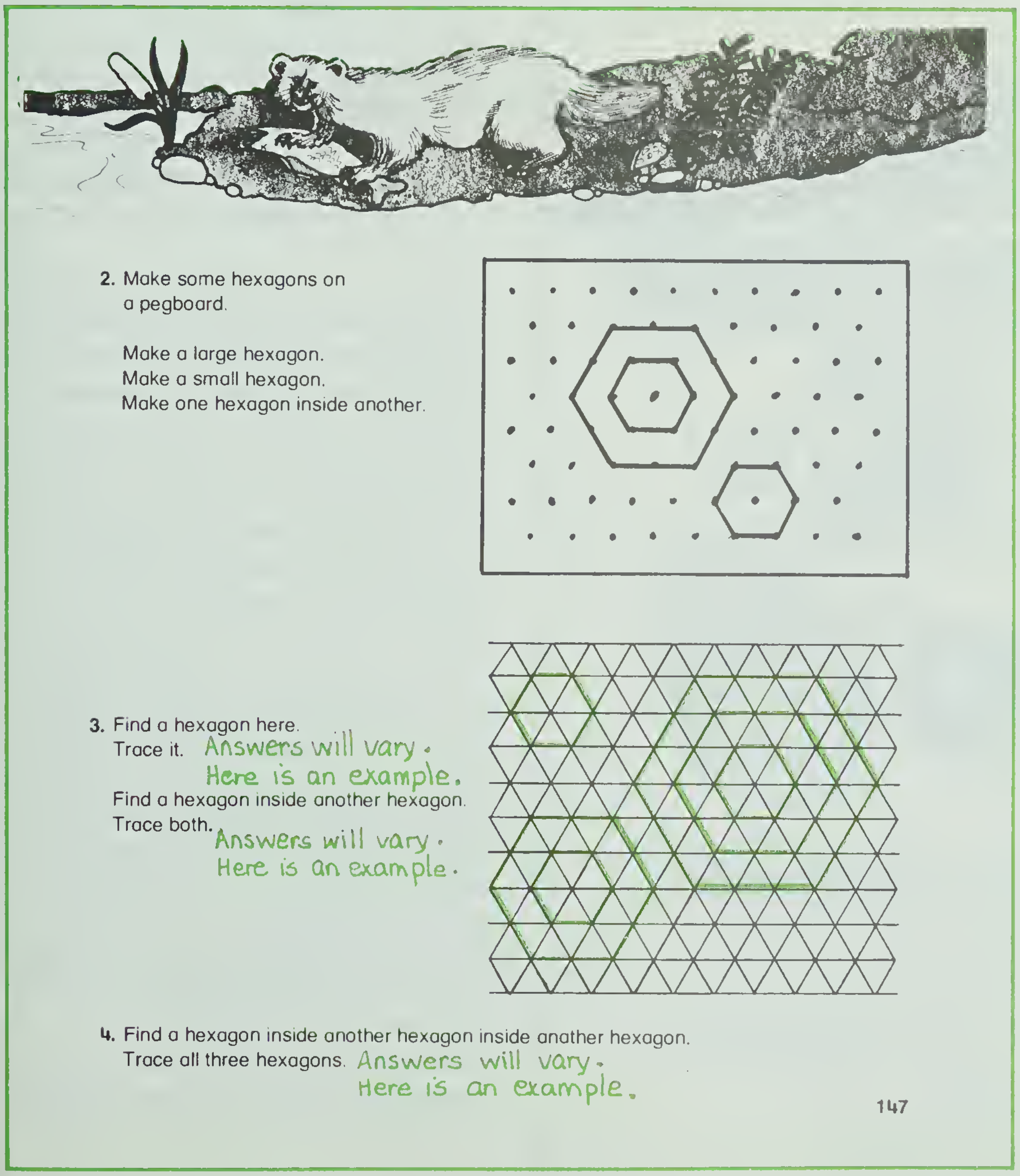
1. Trace and cut out 6 triangles like this.
   Put them together to make a hexagon.

146

Explain that if the sides of a hexagon are equal in length it is called a *regular hexagon*; if they are not equal in length, the hexagon is called *irregular*. Have the children count the sides and vertices of each of the figures. Involve them in a discussion of the similarities and differences between the figures. Then distribute dot paper, made from Program Master 4. Have the children join dots to create as many six-sided figures as they can.







2. Make some hexagons on a pegboard.

Make a large hexagon.
Make a small hexagon.
Make one hexagon inside another.

3. Find a hexagon here.
Trace it. Answers will vary.
Here is an example.
Find a hexagon inside another hexagon.
Trace both. Answers will vary.
Here is an example.

4. Find a hexagon inside another hexagon inside another hexagon.
Trace all three hexagons. Answers will vary.
Here is an example.

147

If there is time and interest, have the children experiment with creating figures that have variable numbers of sides and vertices. If a child draws a pentagon, discuss the figure and tell the children its name. Have the children display their work in the geometry centre.

☐ ☐ ☐

You may wish to send home a letter to keep parents informed of what is happening in the mathematics class. The following may serve as a model.

Dear Parent or Guardian;

During the last few days we have been learning about squares, circles, triangles, rectangles and hexagons. These are important figures for your child. You can become involved this way.

Have your child take you for a walk through the community and show you many examples of each kind of figure. Ask her or him to describe each figure — telling you the number of sides and vertices.

In the children's section of the library there may be books which feature these figures. Ask your child to read to you about these figures.

Discuss the important role geometry plays in the real world.

Finally, you may want to try a few of the exercises found on pages 140-148 in mathways 3. They can be most entertaining.

Unit 2 Section 8 Lesson 5

Exploring Circles: Drawing Circles, Comparing Circular Regions with Circular Objects

Materials

- cylinders
- circular objects: lids, cans, jars, wrapping-paper rolls, sections of pipe
- magazines and catalogues
- for each child
  - – tracing paper
  - – pair of scissors

Lesson

1

Gather the children into the working area. Place the collection of circular objects in the centre and allow the children time to examine and compare them. Have the children give examples of other circular objects in the classroom. These might include the clock face, the ends of pencils, buttons on clothing and so on.

2

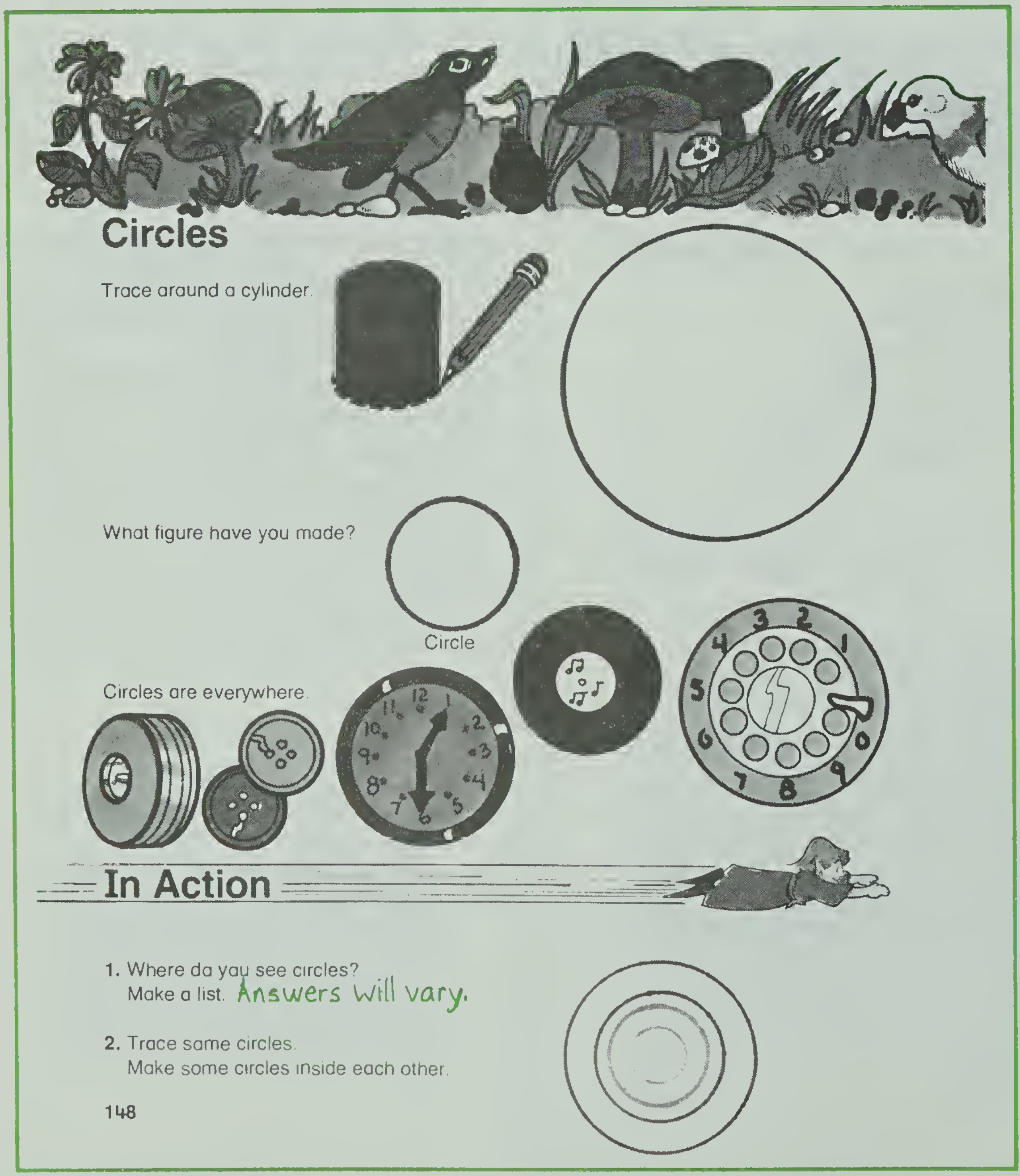
Invite several children to describe circles in their own words. Have a child draw a circle on the easel. Have the other children draw circles of differing sizes.

3

Distribute catalogues and magazines. Have the children locate and cut out pictures that show how circles are used. Discuss the pictures and display them in the geometry centre or have the children glue them into their notebooks.

4

Have the children choose circular objects from the collection, trace around them, cut out the circles and fold them to make triangles or rectangles. Display these in the geometry centre.



Circles

Trace around a cylinder.

What figure have you made?

Circle

Circles are everywhere.

In Action

1. Where do you see circles? Make a list. Answers will vary.
2. Trace some circles. Make some circles inside each other.

148

Written and Other Activities

☐

mathways 3, page 148

Display a cylinder. Have a child point out the faces that suggest circles. Distribute cylinders, needed to complete the opening activity. When the children have completed the In Action exercises, show and discuss their work.

☐ ☐

Display models of all the geometric figures discussed in Section 8. Ask the children to describe the difference between these and the circle, establishing that circles have no sides or vertices, and that circular objects roll. Have the children name objects at home, in the community and in nature that suggest circles.

☐ ☐ ☐

Display and review the figures studied in Section 8: the square, rectangle, triangle, hexagon and circle. Have the children trace around an object of their choice to create a plane figure. Have them cut it out and use it to trace and cut out several identical regions with which to create a design. Have the children colour their designs. Discuss several designs.

☐ ☐ ☐ ☐

Create a riddle about a plane figure:
This figure has four sides.
The sides are equal in length. Which figure am I thinking of?
Encourage the children to create similar riddles without looking at the figures.

☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 30

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Tests 3A, 3B

☐ ☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 44

Unit 2 Section 8 Lesson 6
Solving Word Problems: Adding and Subtracting Amounts of Money

Materials

- for each child
  - – magazine or catalogue
  - – pair of scissors
  - – lightweight cardboard
  - – glue
  - – 50¢ in real coins: quarters, nickels, dimes, pennies *or* play money: Program Masters 8 to 13

Lesson

1

Seat the children around the working area. Distribute magazines, cardboard and pairs of scissors. Have each child cut out and mount a picture of an item and label it with a price tag showing an amount less than 50¢. Invite the children to create problems involving the cut-outs. As each child states a problem, record the addition or subtraction question on the easel.

Julius bought a piece of cake for 12¢ and a glass of milk for 30¢. How much did he pay for his snack?

$$\begin{array}{r} 12 \\ +30 \\ \hline \end{array}$$

Elicit the participation of the children in solving the problem. Have the children continue to create and solve problems as long as interest is high.

2

Draw a number of price tags. Pointing to the tags for 12¢ and 47¢ ask

If you buy things that cost these amounts of money, how much would you pay altogether?

Will you find the total cost by subtracting or by adding? Why?

Have a child write the addition question on the easel, explaining that amounts of money are added in the same way as other numbers, but that the cent symbol is used. Have the child add the amounts and record the sum.

3

Have each child in turn select two price tags from the easel and create a problem to accompany them. Have the children record and add the amounts on the easel. Review any aspects of adding two-digit numbers that present difficulty.

4

Pointing to the price tag for 12¢, ask

If you bought a book for 12¢ and gave the cashier a quarter, how much change would you get? How can you find out?

Have a child record the subtraction question on the easel, subtract and record the difference. Emphasize that the number that is greater than another is always recorded at the top, and that the cent symbol is used to show that the numbers mean amounts of money, rather than cars, sticks of gum, books and so on. Repeat, asking children to subtract various amounts of money – 28¢, 34¢, 47¢ – from 50¢.

Written and Other Activities

☐

mathways 3, page 149

Have the children work in groups of two or three. Provide each group with money to show each of the problems.

☐ ☐

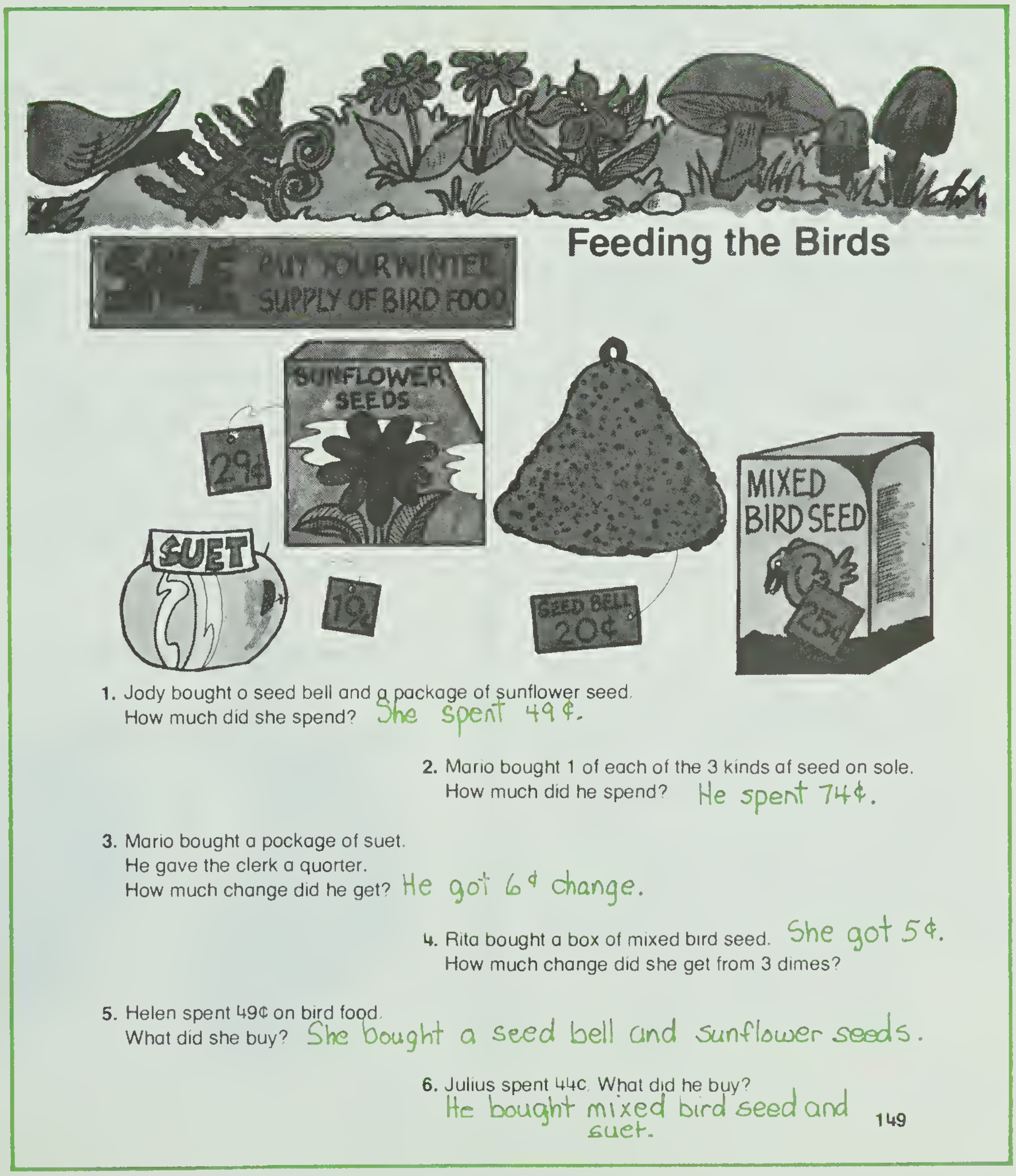
Discuss the pictures at the top of page 149. Have the children create and record two problems that involve flowers, mushrooms and so on. Have them exchange papers and solve each other's problems.

☐ ☐ ☐

mathways 3 Practice Masters page 31

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 45


SALE
PAY YOUR WINTER SUPPLY OF BIRD FOOD
SUNFLOWER SEEDS
29¢
SUET
19¢
SEED BELL
20¢
MIXED BIRD SEED
25¢

Feeding the Birds

1. Jody bought a seed bell and a package of sunflower seed. How much did she spend? She spent 49¢.
2. Mario bought 1 of each of the 3 kinds of seed on sale. How much did he spend? He spent 74¢.
3. Mario bought a package of suet. He gave the clerk a quarter. How much change did he get? He got 6¢ change.
4. Rita bought a box of mixed bird seed. How much change did she get from 3 dimes? She got 5¢.
5. Helen spent 49¢ on bird food. What did she buy? She bought a seed bell and sunflower seeds.
6. Julius spent 44¢. What did he buy? He bought mixed bird seed and suet.

149

Unit 2 Section 9 Lesson 1

Exploring Symmetry

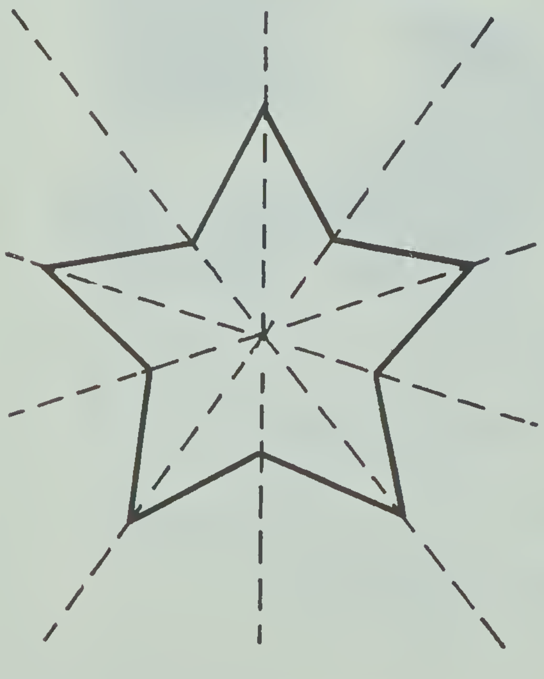
Materials

- for each child
  - – pocket mirror
  - – picture halves, cut along the line of symmetry and mounted on cardboard
  - – magazine
  - – pair of scissors
  - – glue
  - – lightweight cardboard
  - – leaf collection

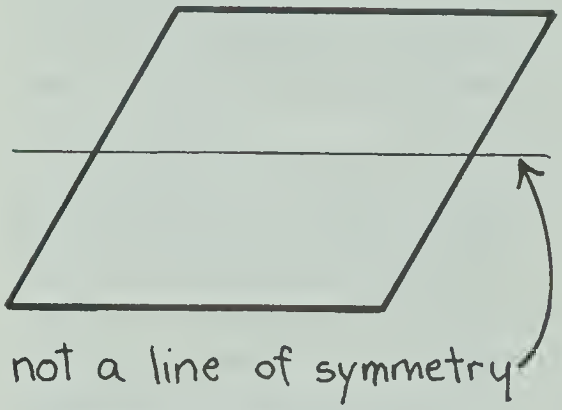
Rationale

Symmetry is found in abundance in nature and in the world of synthetic things: an animal is symmetrical about a vertical plane of symmetry; an automobile is symmetrical in the same way. Symmetry lends beauty and harmony to all that it encompasses, whether seen in the wings of a butterfly or heard in perfectly balanced musical phrases. Children are fascinated by the topic, and quickly develop an intuitive understanding of the basic concept.

Although mathemeticians have developed a number of classifications of symmetry, *mathways* 3 limits the investigation to line symmetry, sometimes called bilateral or reflection symmetry. A figure has line symmetry if the part on one side of a line is the mirror image of the part on the other side. Each dotted line on this star is a line of symmetry.



If a line separates a figure into two congruent parts, but one part is not the mirror image of the other, the line is not a line of symmetry.

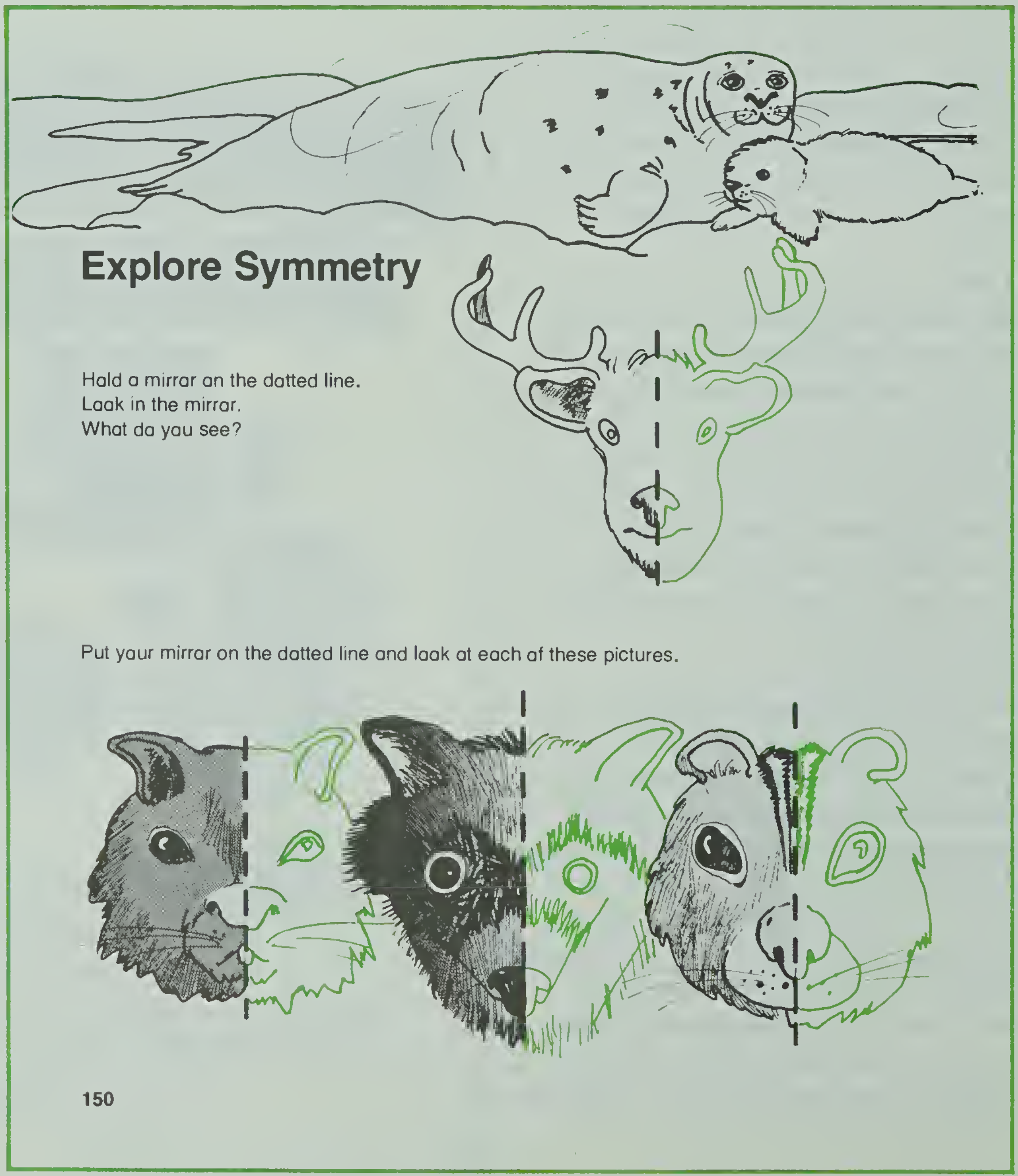


Working with small pocket mirrors and red plastic mirrors adds interest to the exploration, and cutting, folding and matching experiments help children to discover the symmetry in various figures. In this way children learn to appreciate the element of symmetry in the environment. As with other topics in geometry at this level, the emphasis is on exploring and discovering.

Lesson

1

Gather the children into the working area. Distribute pocket mirrors and picture halves mounted on cardboard. Have the children compare the pictures and their reflections, explaining that the reflection is the reversed image of the picture.



Explore Symmetry

Hold a mirror on the dotted line.
Look in the mirror.
What do you see?

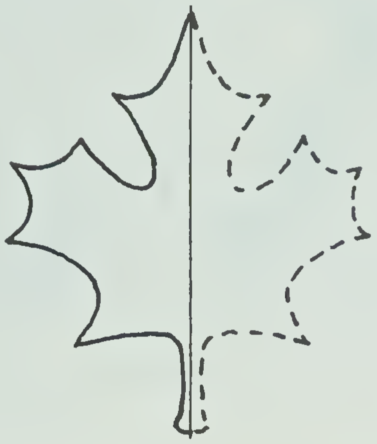
Put your mirror on the dotted line and look at each of these pictures.

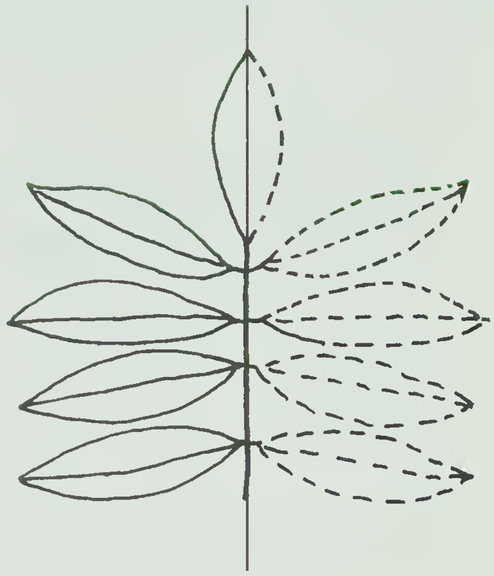
150

2
Selecting from magazines a number of pictures composed of symmetrical and asymmetrical images, show a picture at a time. Ask the children to point out objects whose sides appear to be mirror reflections of each other. Explain that these objects have symmetry, while the other objects either are not symmetrical or the picture does not show their symmetry.

3
Distribute magazines, cardboard, glue and pairs of scissors. Have the children locate and cut out pictures that show symmetry and mount them for a bulletin board display.

4
Have the children bring in leaf collections. Have them examine each leaf in the collection for symmetry.


Simple leaf
(Maple)


Compound leaf
(Sumac)

Have the children exchange collections in order to examine examples of other types of leaves.

Written and Other Activities

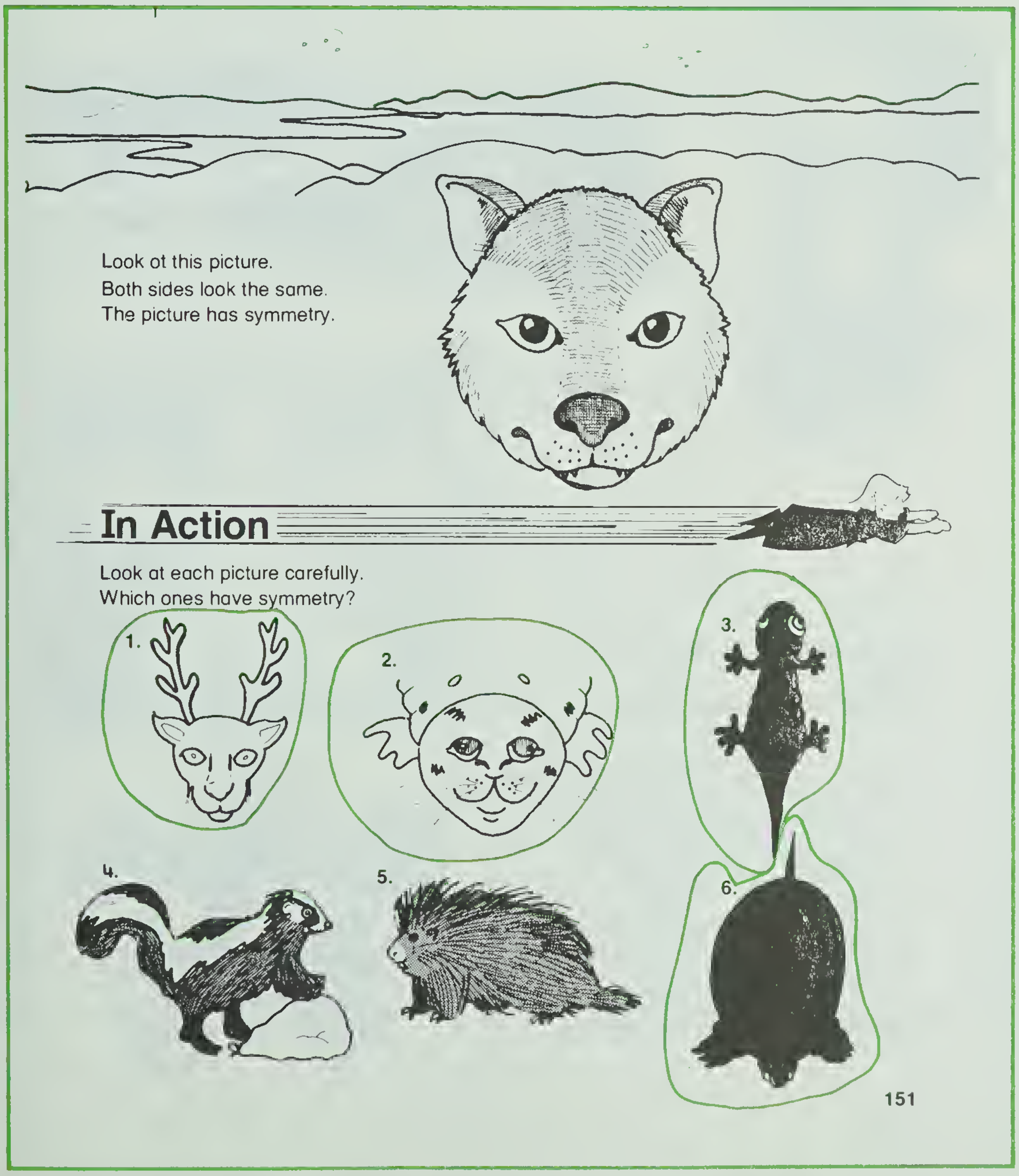
☐

mathways 3, pages 150, 151
Distribute pocket mirrors, needed for completing the introductory activity. Have children explain what they see to the other children. Discuss each picture on both pages before assigning the In Action exercise. When the exercise has been completed, have the children hold mirrors along the line of symmetry in each picture to verify their answers.

☐ ☐

Have groups of children play *Symmetry Says*. The group leader adopts a pose that is symmetrical or asymmetrical.

The other players must duplicate the pose only if it is symmetrical. Players who duplicate an asymmetrical pose drop out of the game.


Look at this picture.
Both sides look the same.
The picture has symmetry.

In Action

Look at each picture carefully.
Which ones have symmetry?

151

Unit 2 Section 9 Lesson 2

Exploring Symmetry: Making Symmetrical Figures

Materials

- collection of pictues of symmetrical objects
- for each child
  - construction paper: one piece 20 cm square in one colour; one piece 25 cm by 45 cm in another colour
  - 1 cm graph paper: Program Master 5
  - magazine
  - pair of scissors
  - glue
  - ruler
  - pocket mirror

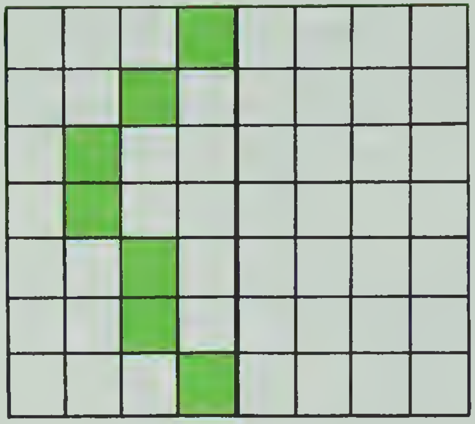
Lesson

1

Invite the children into the working area. Place the collection of pictures in the centre and allow the children time to examine each. Then have each child choose a picture and explain where a mirror would be placed to show a perfect reflection of the part of the picture hidden by the mirror. After each child's explanation, have another child hold a pocket mirror at the line suggested to verify the correctness of the guess. Have the children exchange objects if they wish, and continue to experiment. Discuss the result when the mirror is placed along a line other than the line of symmetry.

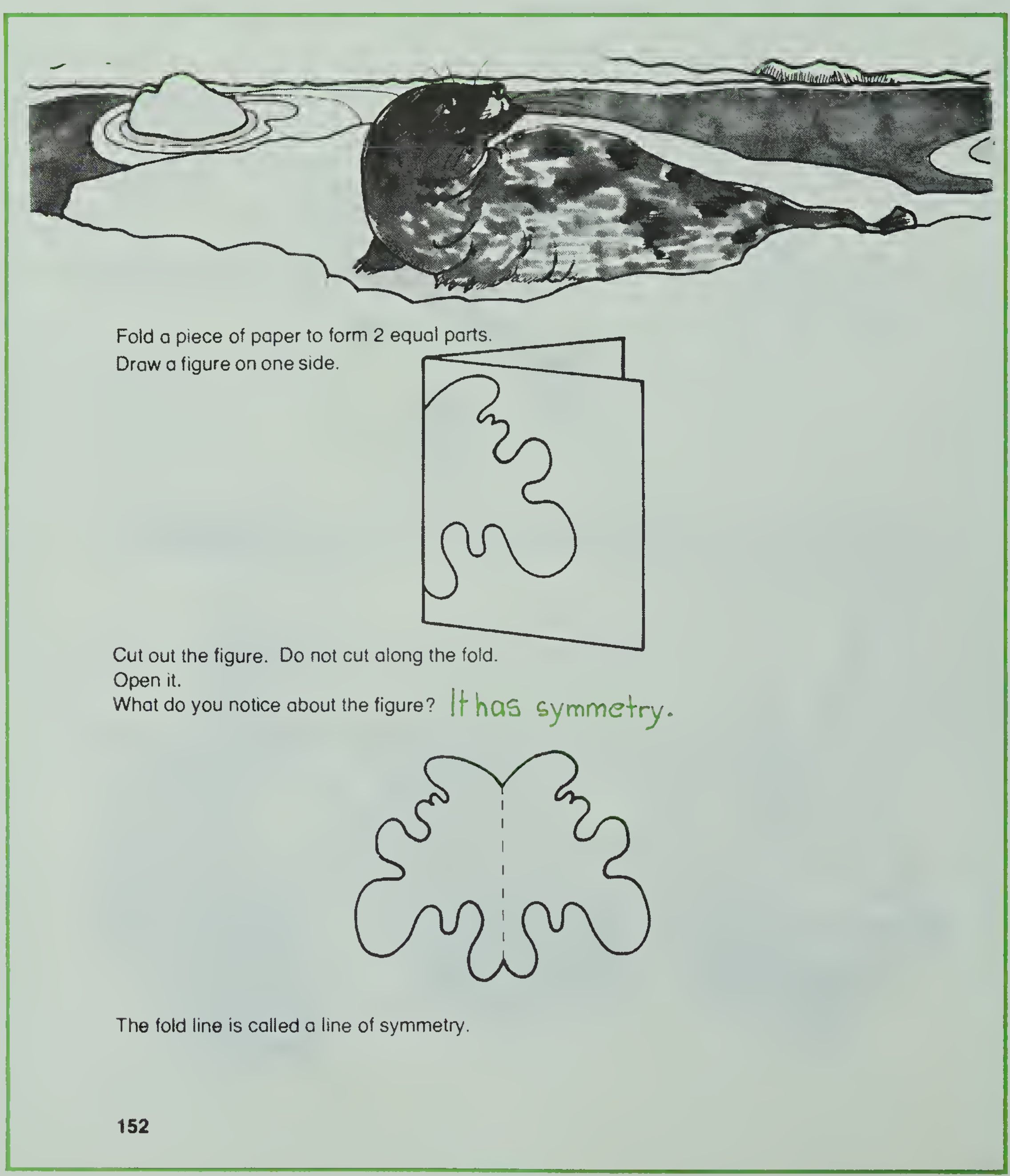
2

Provide each child with a sheet of 1 cm by 1 cm graph paper. Ask them to draw a horizontal or vertical line along an existing line in the middle of their papers. Have them colour squares on one side of the line in a pleasing pattern. Then have them colour the squares on the other side, duplicating the pattern and showing perfect symmetry. Display the patterns.



3

Distribute sheets of graph or grid paper. Have the children fold their sheets in half and draw a simple picture on one side of the fold. Have the children exchange papers and draw a duplicate on the other side of the fold to create a symmetrical picture. Discuss several of the pictures, asking children to comment on the fact that the halves are identical, and to point out the line of symmetry.



Fold a piece of paper to form 2 equal parts.
Draw a figure on one side.

Cut out the figure. Do not cut along the fold.
Open it.
What do you notice about the figure? It has symmetry.

The fold line is called a line of symmetry.

152

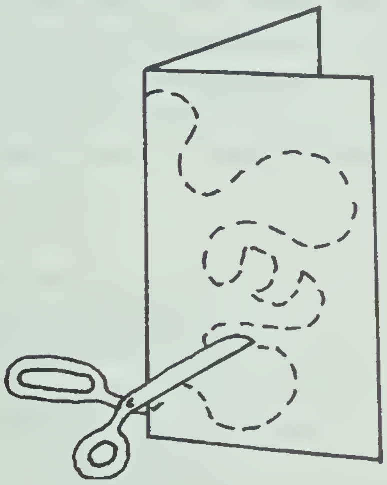
Written and Other Activities

☐

mathways 3, page 152

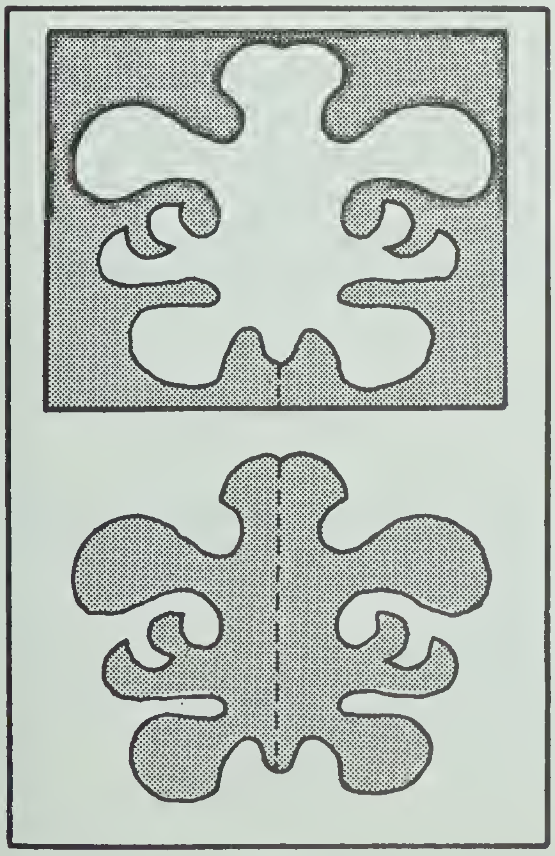
Assist children to follow the directions, cautioning them not to sever the top and bottom of the fold.

Discuss the fact that the two halves of the figure are identical, as are the halves of the paper. Have children show their figures and point to the line of symmetry in each.



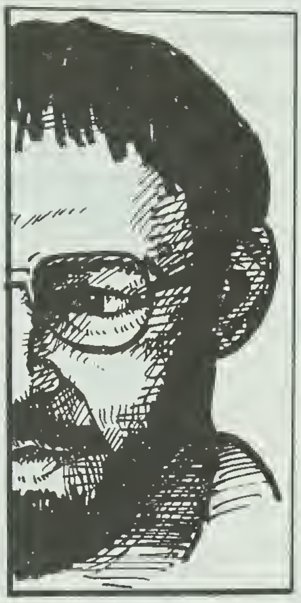
☐ ☐

Distribute the coloured construction paper and have the children glue the figure on one piece and the paper from which the figure was cut on the other. Have the children use the resulting pictures to create an interesting classroom display.



☐ ☐ ☐

Distribute the magazines and have the children cut out faces of animals and people. Have them cut each face in half vertically and glue one half to a sheet of paper. Then, have the children draw the other half of each face. Discuss and display the resulting pictures.



For Your Notes

Unit 2 Section 9 Lesson 3

Exploring Symmetry: Making Symmetrical Figures

Materials

- for each child
  - – copy of stencils, *see* **2**
  - – pair of scissors
  - – tracing paper
  - – lightweight cardboard
  - – several squares of paper

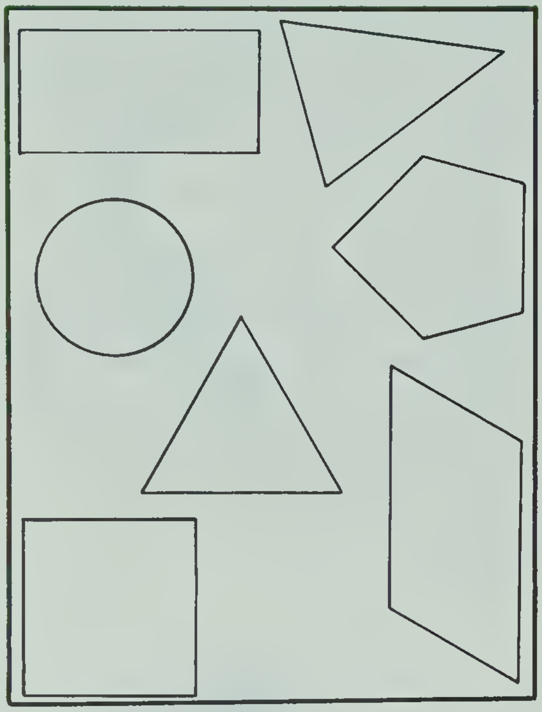
Lesson

1

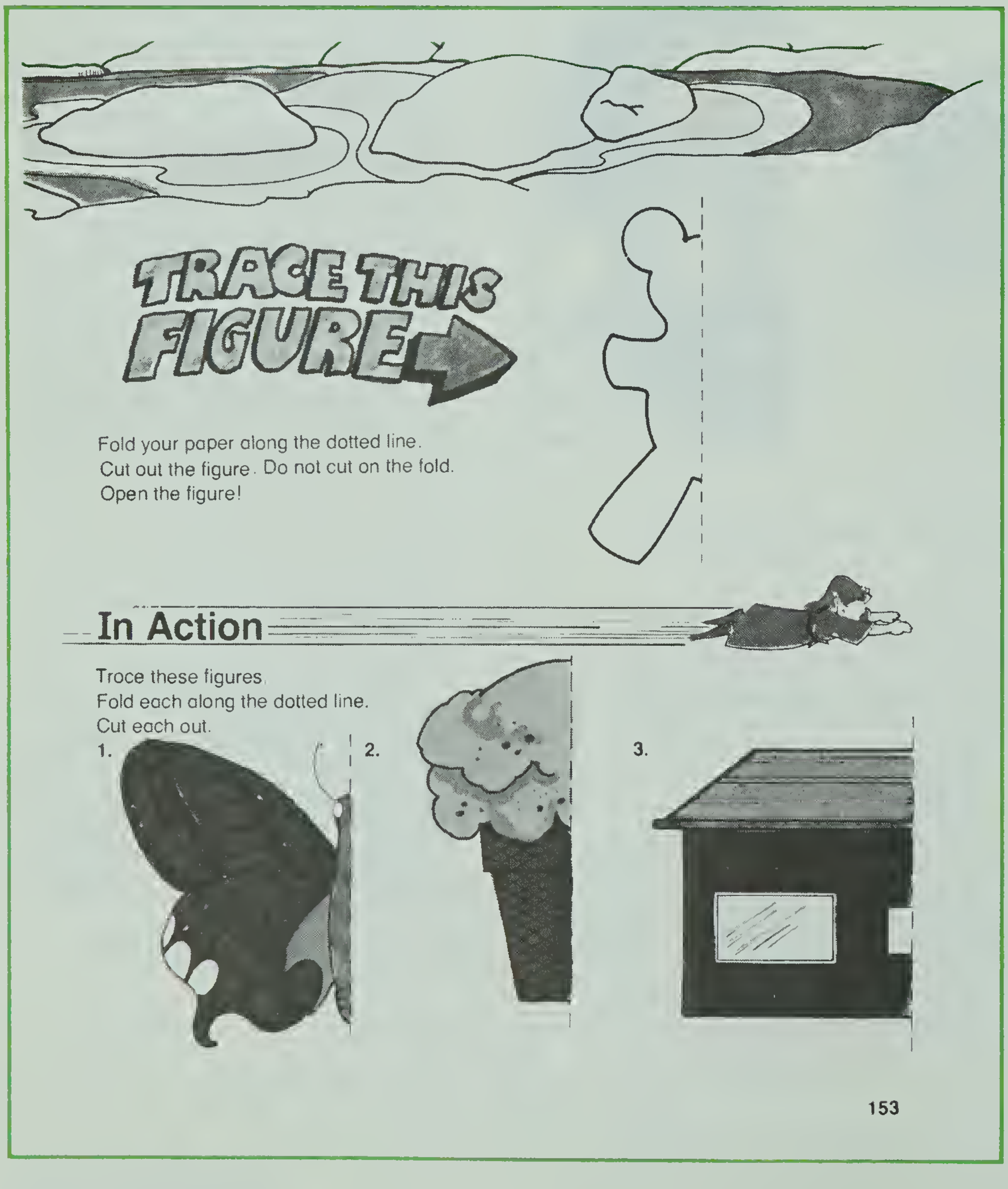
Discuss several of the figures, created for page 152, on display in the classroom. Have children tell what they find pleasing about each and point out the line of symmetry.

2

Distribute copies of stencils showing the following figures:



Have the children cut out the figures and fold them to discover some of the lines of symmetry.



TRACE THIS FIGURE

Fold your paper along the dotted line.
Cut out the figure. Do not cut on the fold.
Open the figure!

In Action

Trace these figures.
Fold each along the dotted line.
Cut each out.

1.

2.

3.

153

Written and Other Activities

☐

mathways 3, page 153

Assist children who have difficulty following the directions. When the figures called for have been completed, ask children to show their figures and tell whether or not they are symmetrical, explaining why or why not in their own words. When the In Action activities have been completed, discuss the symmetry in the resulting pictures.

☐ ☐

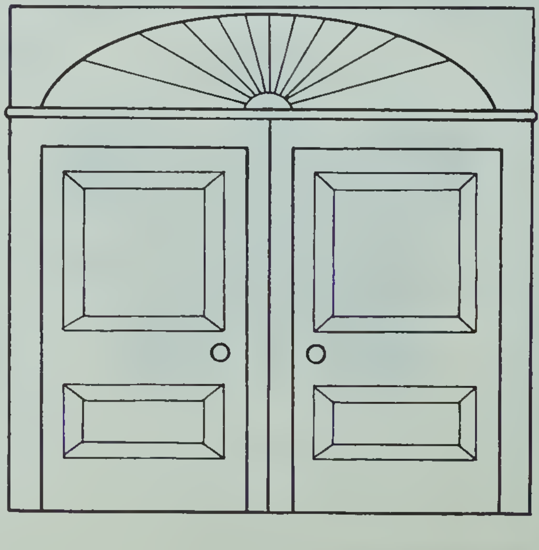
To challenge children who have an intuitive grasp of symmetry, give them several squares of paper each. Have the children cut a figure from each square of paper, one that shows a single line of symmetry, one figure showing two lines of symmetry, and another showing four lines of symmetry.

☐ ☐ ☐

Take the children on a walk in the community. Have them point out lines of symmetry in the things they see. Discuss with the children how symmetry pleases the eye: would objects or natural things give as much pleasure if they were asymmetrical?

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 46



Unit 2 Section 9 Lesson 4

Byway: Sliding and Tracing Figures to Create Designs

Materials

- cardboard figure
- for each child
  - lightweight cardboard
  - pair of scissors

Rationale

Page 154 of the children's text introduces them to motion geometry, in which a figure is duplicated in new positions while retaining the shape and size of the original. Sliding a figure vertically, horizontally or diagonally, flipping it or turning it without lifting it from the surface are the motions used. The figures may or may not overlap, depending on the desired result.

Lesson

1

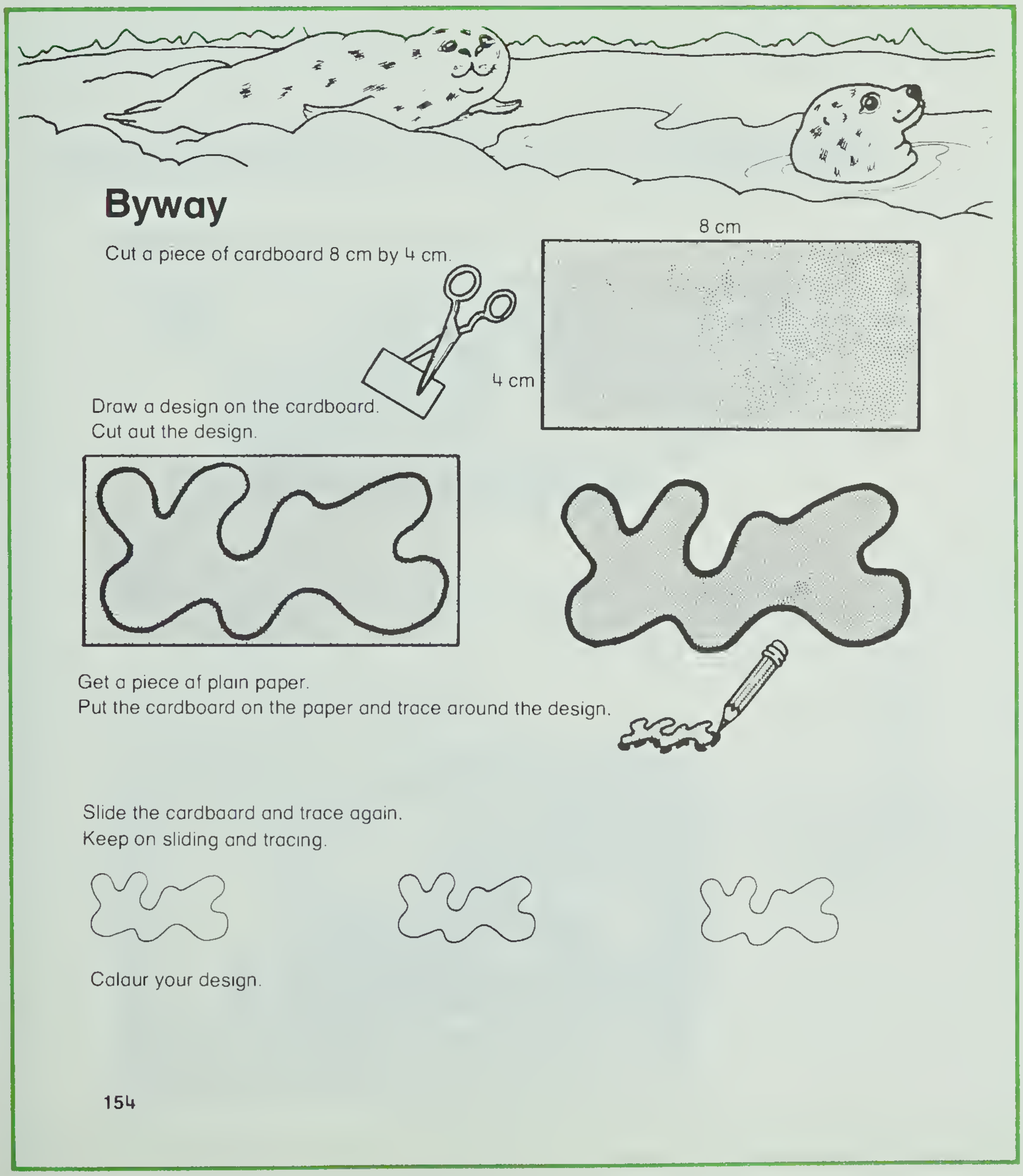
Gather the children around the easel. Using the model made in advance, trace a figure. Then, holding the figure in its original position, ask a child to come to the easel, slide the figure without lifting it and trace it again. Explain that the figure may be moved up, down or diagonally, and that the new figure may overlap the original if desired. Tell the child to hold the figure in its new position and appoint a classmate to slide and trace the figure again. Continue the activity in this fashion. Discuss the result.

Written and Other Activities

☐

mathways 3, page 154

Have a child read the directions aloud. Discuss them, reminding the children that they may slide the figure in any direction and that new positions may overlap. Provide a focus for the activity by announcing that the designs will be used for a class display. The children may enjoy repeating the activity to experiment with other designs.



Byway

Cut a piece of cardboard 8 cm by 4 cm.

Draw a design on the cardboard.
Cut out the design.

Get a piece of plain paper.
Put the cardboard on the paper and trace around the design.

Slide the cardboard and trace again.
Keep on sliding and tracing.

Colour your design.

154

Unit 2 Section 10 Lesson 1

Exploring Perimeter: Measuring with Centimetres, Problem Solving

Materials

- birthday card, length of sides given in centimetres
- set of cards in assorted sizes, length of sides given in centimetres
- assorted non-standard units: toothpicks, straws, paper clips and so on
- for each group
  - sheet of chart paper
  - construction paper

Rationale

The main concept presented in Section 10 is that perimeter is the distance around an object. No formula for finding perimeter is given at this level. Rather, perimeter consists of the total number of units, in this case, centimetres. The concept of perimeter is developed in three stages: the lengths of the sides of a rectangle or square are given and the children add to find the perimeter; the sides of a figure are marked off at one-centimetre intervals and the children count the number of units; the children estimate the length of the sides then measure and add to find the distance around the figure. The Byway page, which closes the Section, extends the idea to circles and the term *circumference* is introduced.

The children's understanding of perimeter depends on the number of opportunities they are given to experience measuring objects and figures in a variety of sizes: a desk top, a book, a birthday card. Some children, who have had little previous experience in measuring, may benefit from using non-standard units to begin with, and activities of this kind are provided under Written and Other Activities.

Lesson

1

Gather the children into the working area. Explain that it is sometimes necessary to find the distance around objects. Running your finger around a book, tell the children that this is the distance around. Ask a child to show the distance around a table. Have another child show the distance around a desk top and another the distance around the classroom.

2

Display a birthday card. Handing it to a child, say

Show us the distance around this card.

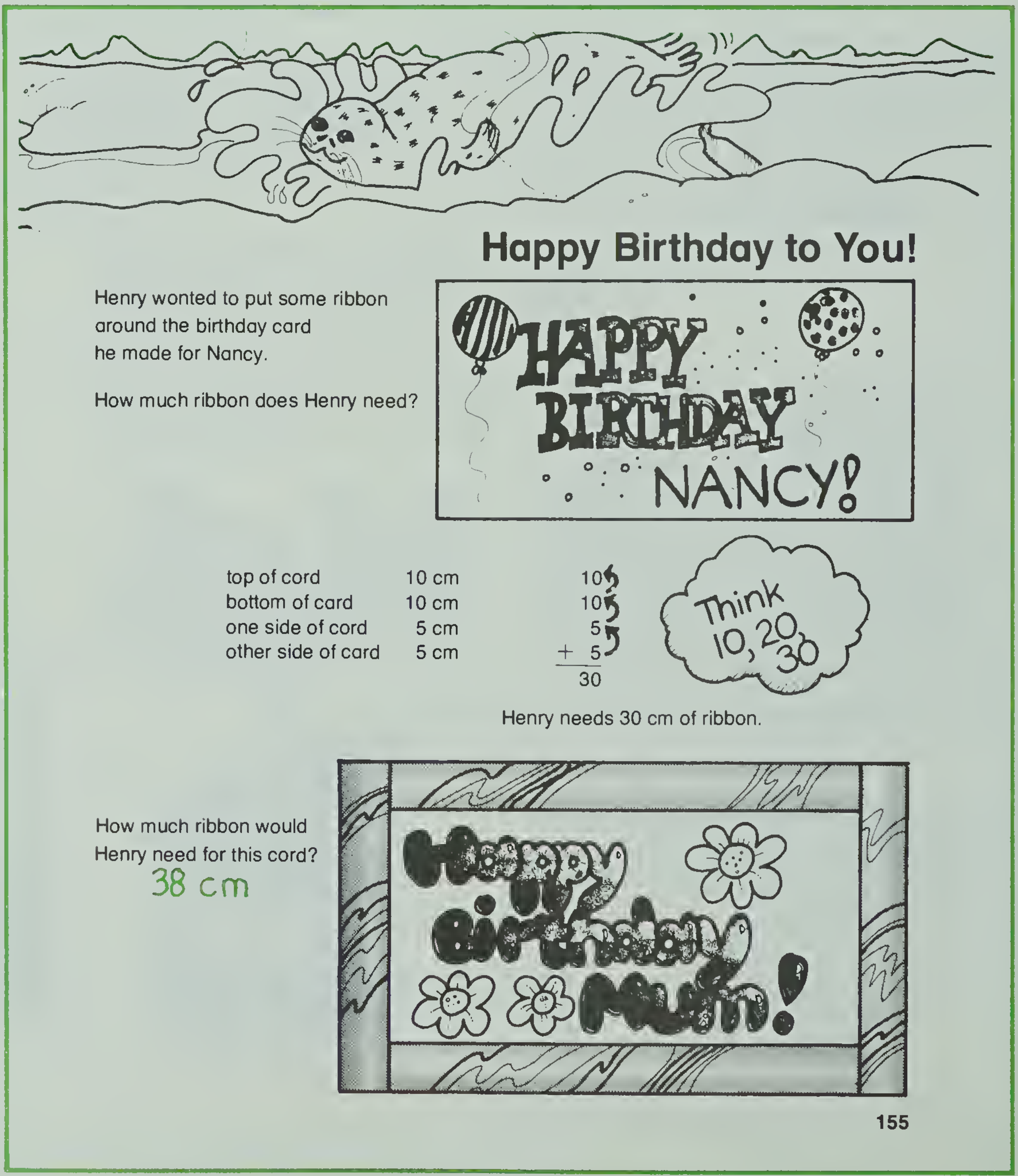
Ask a child to measure the length of one side and tell its length. Say

The length of this side is nine centimetres.

Have three children measure the remaining sides and make similar statements. Then ask the children to suggest as many ways as they can think of to find the total distance around the card.

3

Distribute cards or rectangles of various sizes.



Happy Birthday to You!

Henry wanted to put some ribbon
around the birthday card
he made for Nancy.

How much ribbon does Henry need?

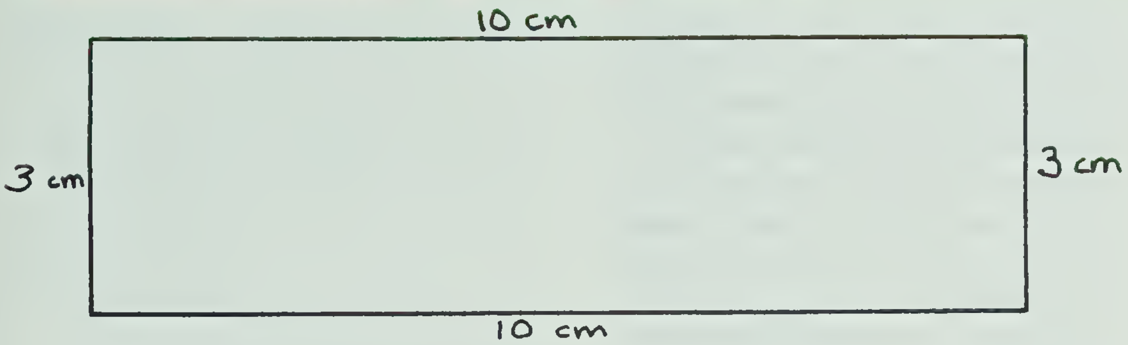
top of card	10 cm
bottom of card	10 cm
one side of card	5 cm
other side of card	5 cm

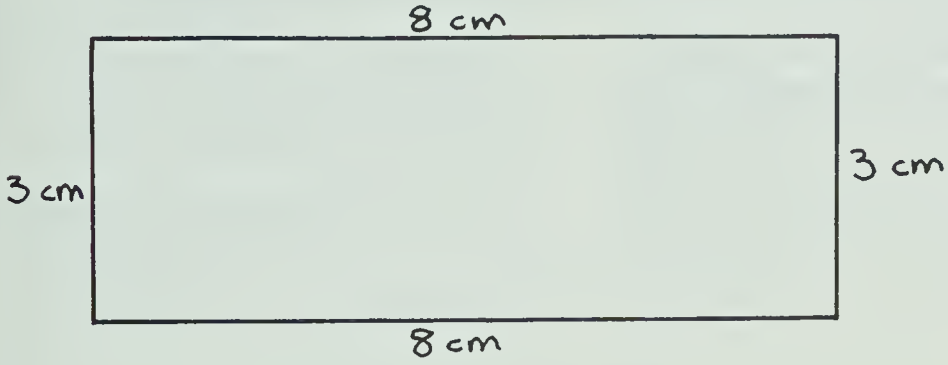
$$\begin{array}{r}10\\10\\5\\+\ 5\\\hline 30\end{array}$$

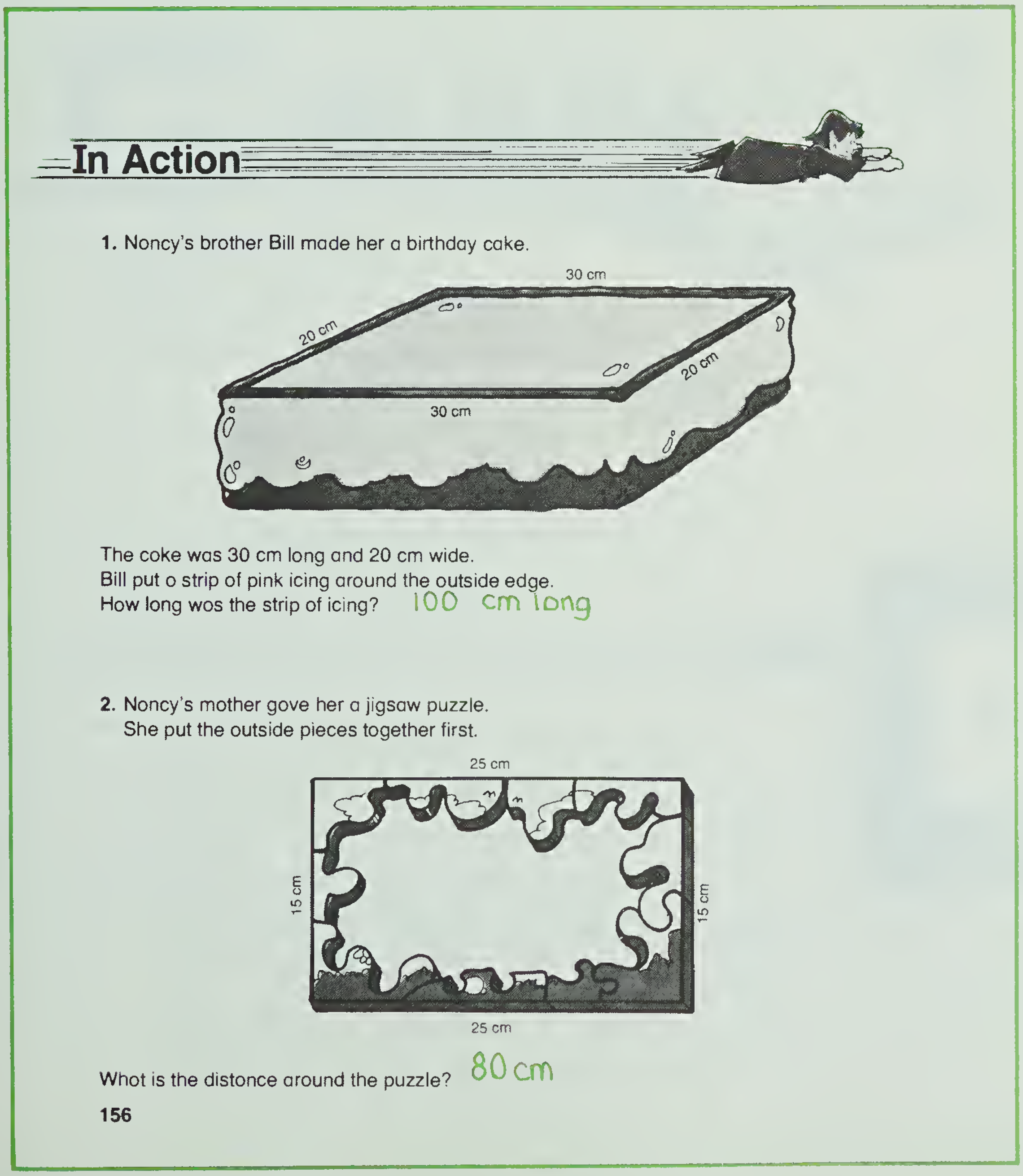
Henry needs 30 cm of ribbon.

How much ribbon would
Henry need for this card?
38 cm

155







In Action

1. Nancy's brother Bill made her a birthday cake.

The cake was 30 cm long and 20 cm wide.
Bill put a strip of pink icing around the outside edge.
How long was the strip of icing? 100 cm long

2. Nancy's mother gave her a jigsaw puzzle.
She put the outside pieces together first.

What is the distance around the puzzle? 80 cm

156

Challenge the children by asking them to find and record the distance around their cards. As a greater challenge, present a word problem for the children to solve. For example *I want to paint pictures on these cards and frame them for Christmas gifts. To make the frame for each picture, I must buy a strip of wood that is exactly the same length as the distance around the card. What length should I buy?*

Written and Other Activities

☐

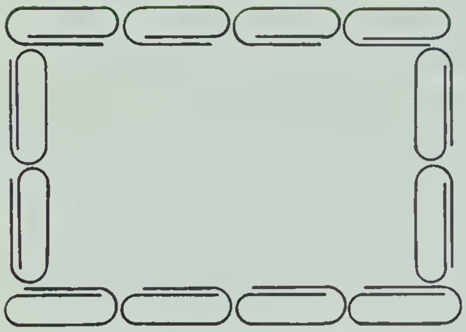
mathways 3, pages 155, 156, 157
Have a child read the word problems on the pages aloud. Ask other children to restate the problems in their own words. Discuss the method of solving the problems shown, explaining that the unit of measurement, the centimetre, must be given with the numeral that tells the distance around. Ask two or three children to suggest another way of finding out how much material would be needed to border the figures. Discuss which of the methods is most practical.

☐ ☐

Divide the class into small groups. Have each group tell as many reasons as they can think of for finding the distance around objects. They may mention trimming objects, drawing borders, building fences, constructing walls and so on.

☐ ☐ ☐

To provide experience in using non-standard units, have the children create figures by gluing toothpicks, straws or paper clips to construction paper. Have them count the objects used to form each side and record the total number along with the name of the object to give the perimeter.



Perimeter = 12 Paper clips

Alternatively, distribute the cards prepared for step 3 of the lesson and have children use a non-standard unit to measure each side. Have them record each length to the nearest unit and the total number of units, giving the perimeter in a complete sentence. For example

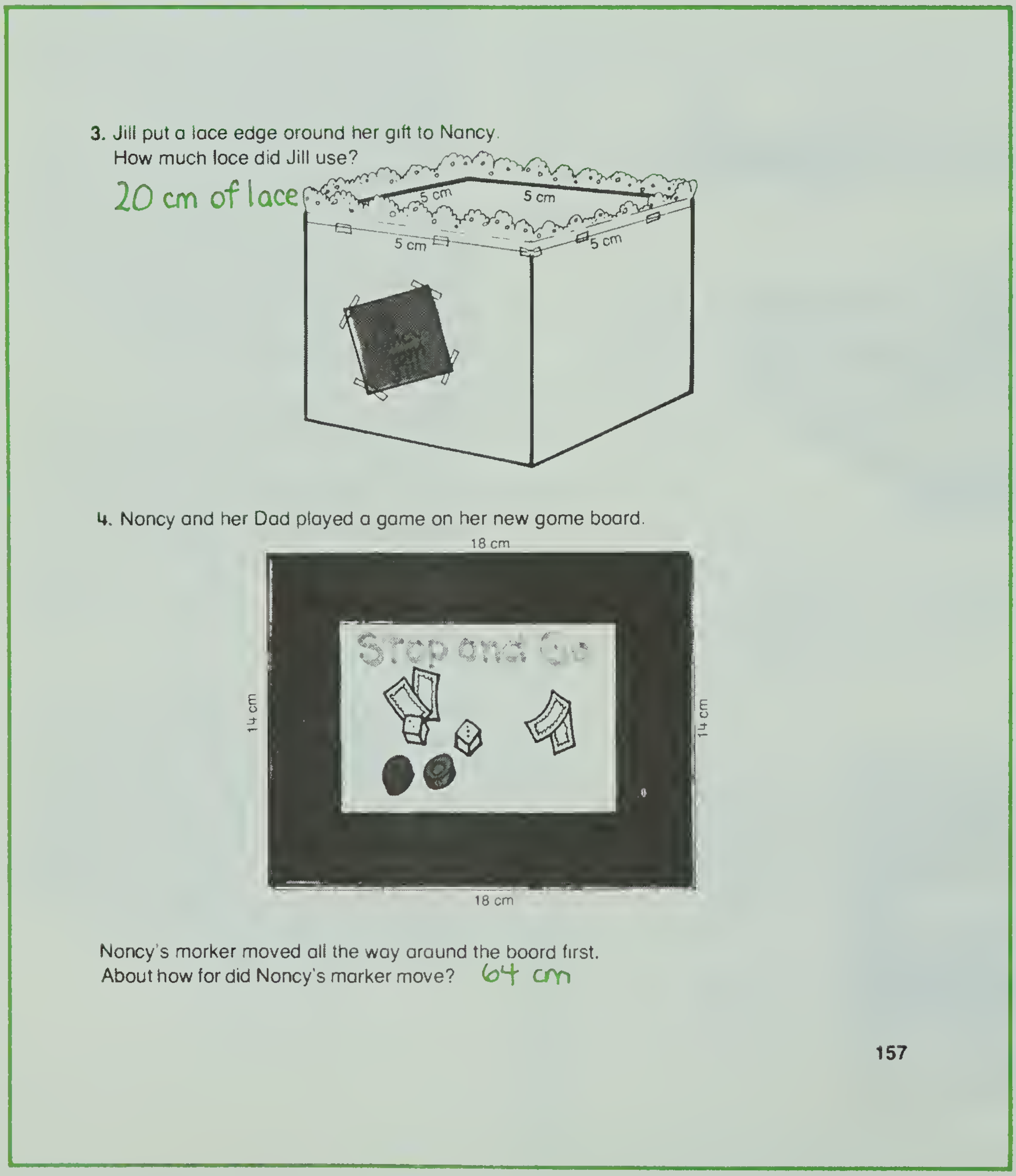
The distance around the rectangle is 15 toothpicks.

Have the children choose a different unit of measure, for example, paper clips, and measure the same figure again, giving the perimeter in a full sentence and naming the unit used.

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 47

For Your Notes



3. Jill put a lace edge around her gift to Nancy. How much lace did Jill use? 20 cm of lace

4. Nancy and her Dad played a game on her new game board.

Nancy's marker moved all the way around the board first. About how far did Nancy's marker move? 64 cm

157

Unit 2 Section 10 Lesson 2

Exploring Perimeter: Counting Centimetres, Adding

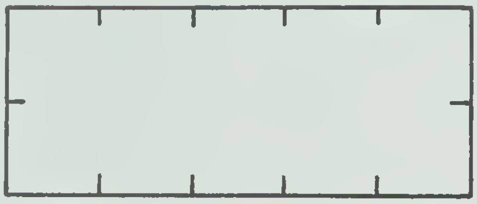
Materials

- collection of cardboard figures of various sizes: rectangles, parallelograms, hexagons, squares, the length of the sides marked at 1 cm intervals
- for each child
  - two sheets of 1 cm graph paper: Program Master 5
- for each group
  - non-standard units: lengths of string or ribbon, straws, paper clips, unit strips, erasers and so on
- stencil: several figures on 1 cm graph paper

Lesson

1

Seat the children around the working area. Introduce the word *perimeter*. Tell the children that the distance around something is called its perimeter. Give each child a cardboard figure whose sides have been marked off at 1 cm intervals.



Then, ask a child to show the perimeter of the figure by running a finger around it. Point out the markings on the figure and ask a child to tell the distance between each mark. When it has been established that each interval is 1 cm, ask

How can we find the perimeter of this figure in centimetres?

Suggested methods can include counting the number of centimetre intervals on each side, recording the numerals and adding; or counting the total number of centimetre intervals. Have the children use each method in turn to find the perimeter of their figures in centimetres. Have the children exchange figures and, again, use both methods to find the perimeter.

2

Give each child a sheet of 1 cm graph paper. Have the children use their rulers to draw 10 figures and instruct them to record the perimeter of each.

Written and Other Activities

☐

mathways 3, page 158

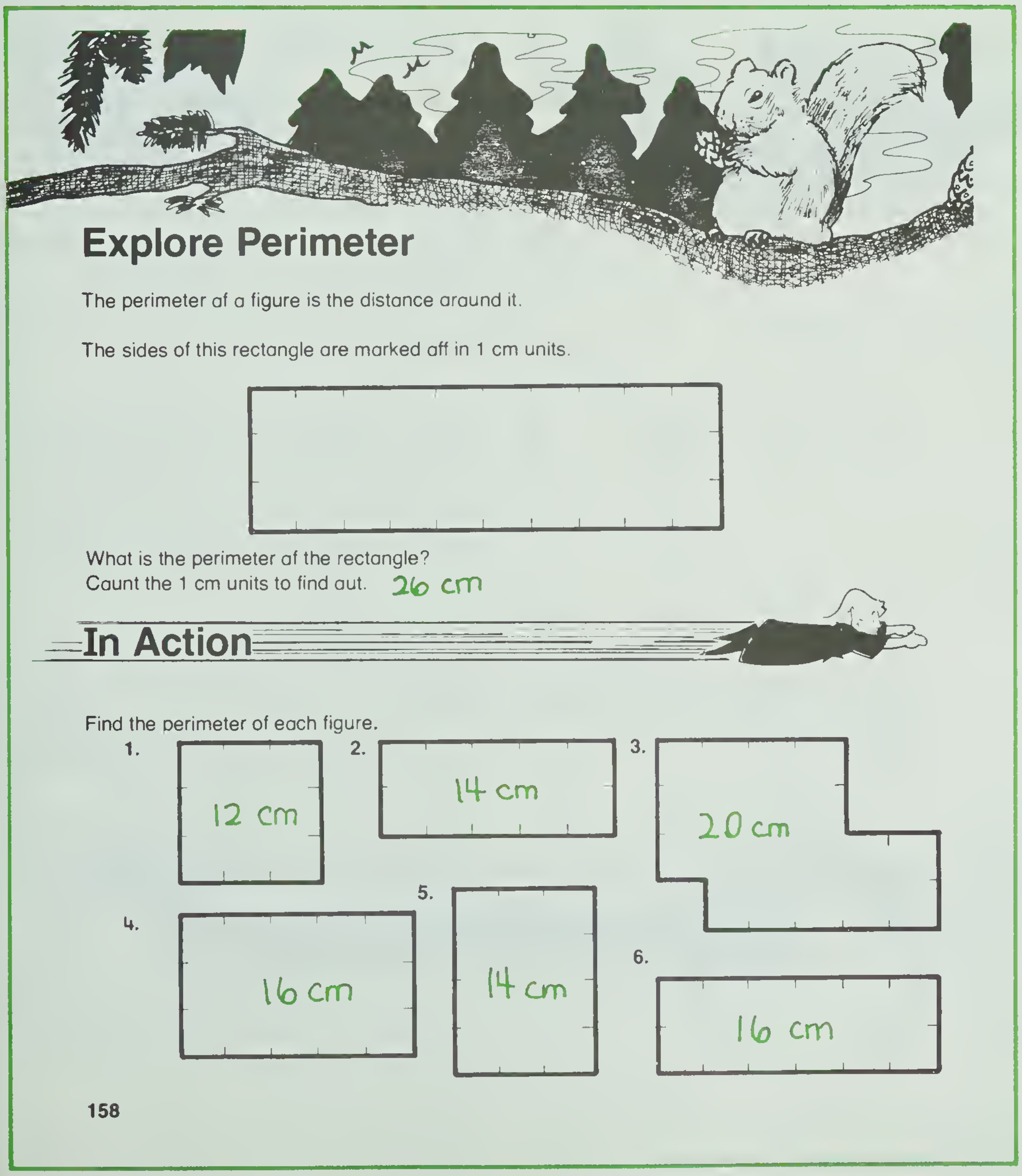
Before assigning the page, have a child read the example problem and describe two methods of finding the perimeter. Compare and discuss results.

☐ ☐

Using Program Master 5, prepare a stencil showing several figures. Have the children count the 1 cm intervals to find the perimeter of each and record it in centimetres.

☐ ☐ ☐

Distribute sheets of 1 cm graph paper. Have each child draw three figures: one figure that has a perimeter of 10 cm; one that has a perimeter of 15 cm; one that has a perimeter of 20 cm. Have the children compare each figure with the same one drawn by a classmate. Then have the children record in centimetres, the perimeter of each figure.



Explore Perimeter

The perimeter of a figure is the distance around it.

The sides of this rectangle are marked off in 1 cm units.

What is the perimeter of the rectangle?
Count the 1 cm units to find out. 26 cm

In Action

Find the perimeter of each figure.

1. 12 cm
2. 14 cm
3. 20 cm
4. 16 cm
5. 14 cm
6. 16 cm

158

Unit 2 Section 10 Lesson 3

Exploring Perimeter: Measuring with Centimetre Rulers

Materials

- collection of cardboard figures with exact dimensions in centimetres, not marked
- ball of string
- for each child
  - centimetre ruler
  - sheet of dot paper: Program Master 2

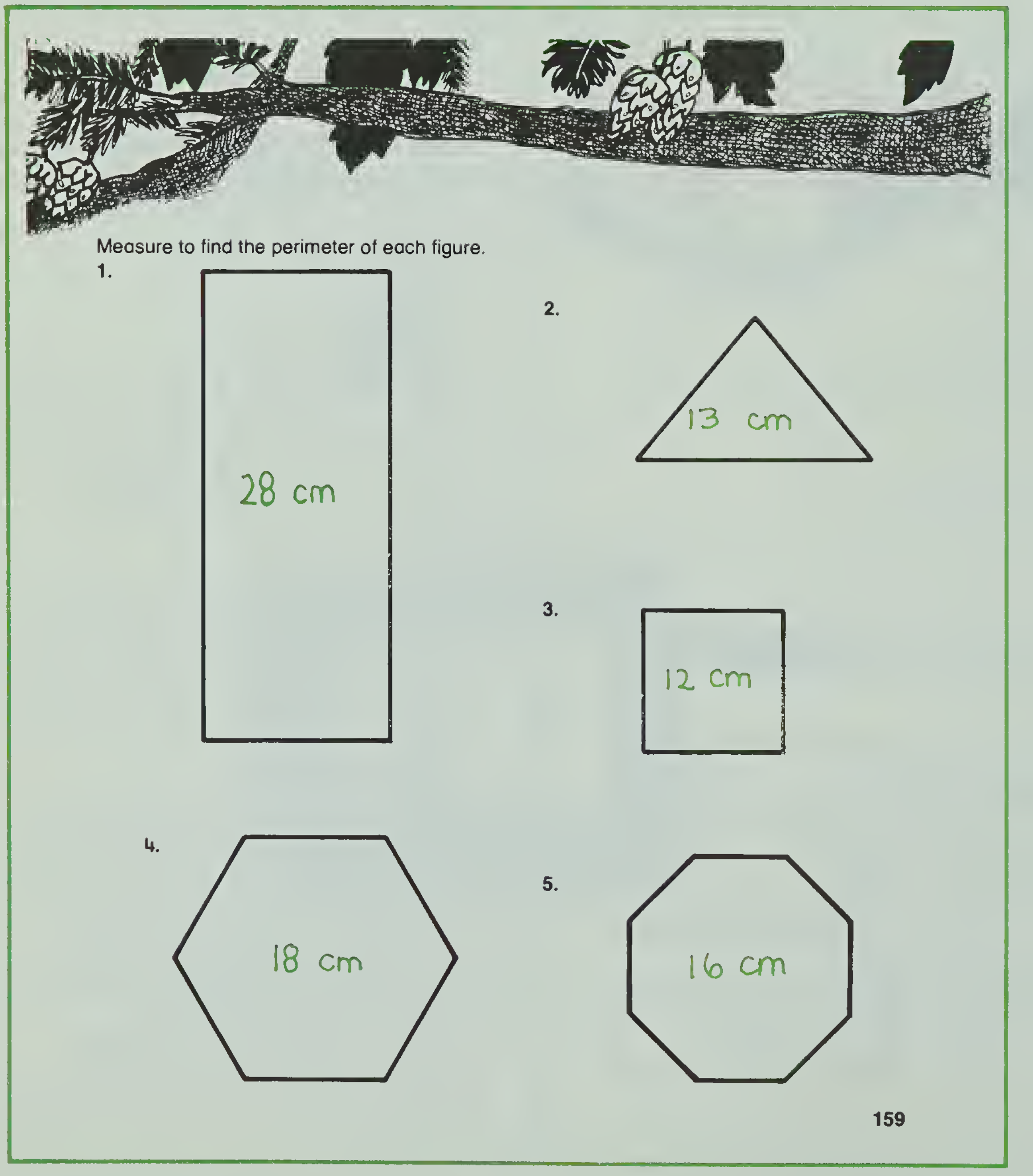
Lesson

1

Gather the children into the working area. Display a cardboard figure. Ask a child to show what is meant by perimeter, using the figure to demonstrate. Then, ask how the perimeter can be found when the lengths of the sides are not given and the sides have not been marked off at centimetre intervals. The children may suggest using a ruler to measure each side, recording each length in centimetres and adding; or they may suggest using a length of string and then measuring the string with a ruler. Give each child a length of string and a figure. Have the children guide the string along the edge, cut it to the exact perimeter, then measure the string with a centimetre ruler. Remind the children to align the end of the string with the zero mark on their rulers. Have them record the perimeter of their figures in centimetres.

2

Have the children measure the sides of their figures, using centimetre rulers, record the length of each side in centimetres, add and record the perimeter in a complete sentence that names the units used. Remind them to align the edge of each side with the zero mark on their rulers. Then have the children exchange figures and measure again. Have the children compare their results.



Measure to find the perimeter of each figure.

1. 28 cm

2. 13 cm

3. 12 cm

4. 18 cm

5. 16 cm

159

Written and Other Activities

☐

mathways 3, page 159

Have children identify the figures and count the sides. Record the name of each figure on the easel in the following manner:

Rectangle
Number of sides ____
Length of sides ____
____
____
____
Perimeter ____

Have the children supply the information for the chart. Repeat for each figure. Remind the children to align the zero mark on their rulers with the edges of the figures. Discuss the results.

☐ ☐

Give each child a copy of dot paper. Have the children join dots to create three figures: one that has a perimeter of 10 cm and two that have perimeters of 25 cm. Show and discuss the resulting figures, noting the difference in the figures having identical perimeters.

☐ ☐ ☐

Have each child draw four figures on a plain sheet of paper, measure the sides to the nearest centimetre, and find and record the perimeter of each figure.

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 48

Unit 2 Section 10 Lesson 4

Byway: Finding the Perimeter of a Circle

Materials

- collection of circular objects: records, plates, flat plastic lids, hoola hoops, embroidery frame, metal washers and so on
- for each child
  - centimetre ruler
  - length of string
  - tracing paper
  - copy of stencil, *see* ☐ ☐ ☐ ☐

Lesson

1

Gather the children around the easel. Draw a large circle and ask

Do you think a circle can have a perimeter? Why?

Have a child trace the edge of the circle to show the perimeter, or distance around. Invite the children to suggest ways in which the perimeter of the circle could be found.

2

Place the collection of circular objects in the centre of the working area. Make an easel chart such as the following and have the children copy it into their notebooks:

Object	Estimate	Perimeter
blue plate		
white plate		
record		
embroidery hoop		
⋮		

Have the children select objects, estimate and record the estimated distance in centimetres around each. Then have them measure the objects with string, trimming it to size, and measure the string with their rulers to find the perimeter of the objects. Encourage the children to compare the information on their charts. Discuss differences between the estimates and the perimeters.

Written and Other Activities

☐

mathways 3, page 160

Have a child read the question aloud. When it has been established that using string is one method, encourage the children to think creatively to find other ways of solving the problem.

☐ ☐

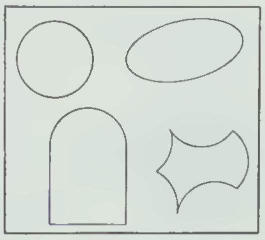
Give each child a sheet of tracing paper. Have the children trace and measure with string the outline of each hand. Is the distance around both hands the same number of centimetres? Are any of the children's hands exactly the same size? Can we call the distance around these outlines the perimeter?

☐ ☐ ☐

Have the children use string to find the perimeter of each figure on page 159. Compare the results. Discuss whether measuring with string produces as accurate a measure of such figures as measuring with a ruler.

☐ ☐ ☐ ☐

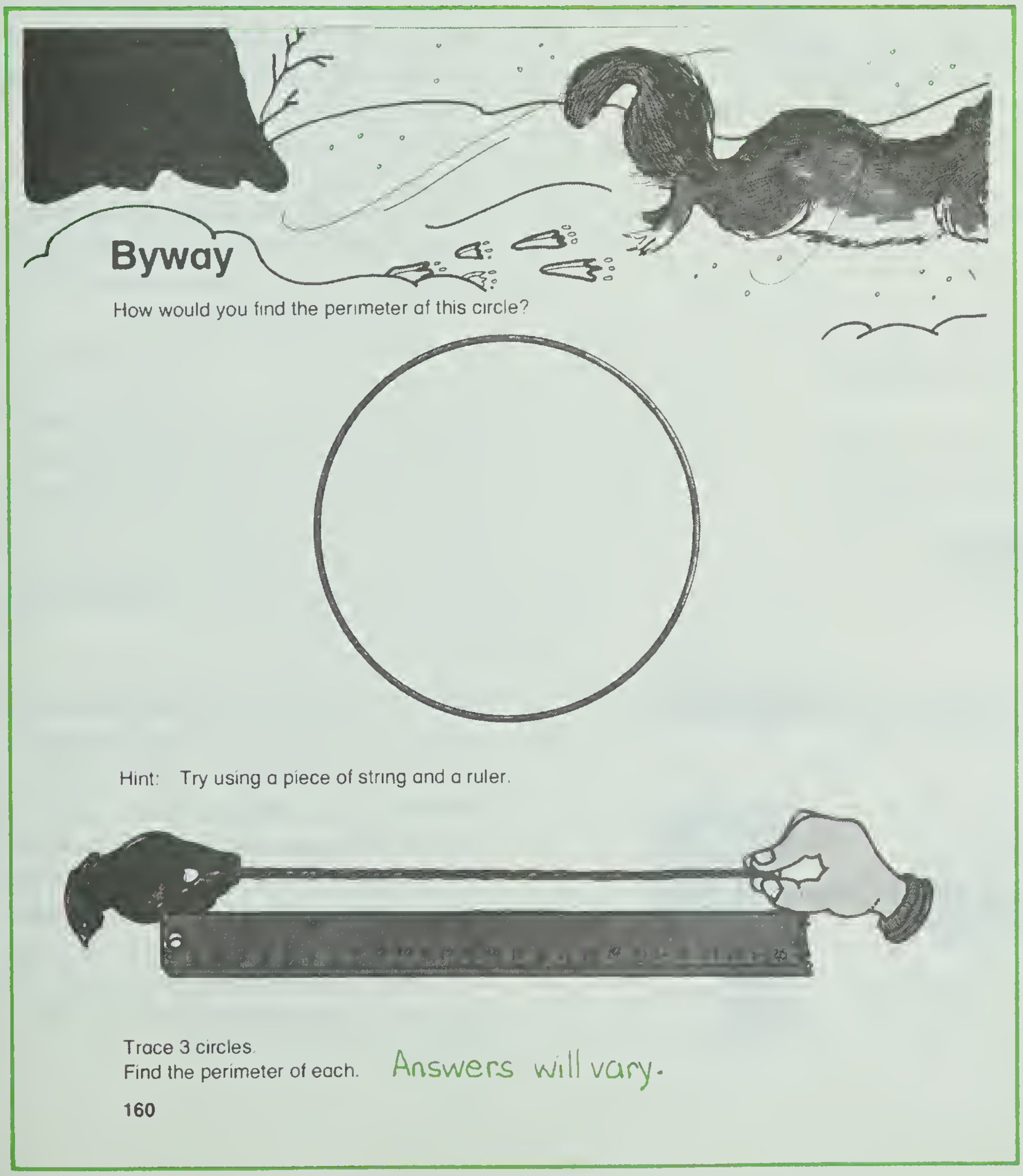
Prepare a stencil showing figures such as the following:



Have the children find the perimeter of each.

☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 32



Byway

How would you find the perimeter of this circle?

Hint: Try using a piece of string and a ruler.

Trace 3 circles.
Find the perimeter of each. Answers will vary.

160

Unit 2 Section 11 Lesson 1

Exploring Decimals: 0.1 to 0.9

Materials

- fractional pies for 0.1 to 0.9, with tenths coloured red: Program Master 33
- for each child
  - sheet of 2 cm graph paper: Program Master 6
  - pair of scissors
  - glue
  - copy of Program Master 33
  - lightweight cardboard

Rationale

In previous lessons, the children learned that when an object is divided into 10 equal parts, one part is one-tenth of the whole, or 0.1. The lessons in Section 11 build on the concept of tenths to introduce decimals to 0.9. Extending this concept requires that children have experience with three representations of numbers: the name of the number, the physical representation and the numeral. Presented with one of these forms, the children should be able to supply the other two. That is, hearing

Three decimal two,

the children write

3.2

and point to three whole objects and two equal parts; seeing the numeral, the children say the name and point to the numeral's concrete form; seeing the concrete form, they say the number's name and write the numeral.

Concrete and semi-concrete materials play a major role in developing the concept of decimals.

Lesson

1

Seat the children around the working area. Displaying a fractional pie with one part coloured red, review the concept of tenths. Ask

How many parts make up this whole pie?

Are all the parts equal?

What is the name of the part that is coloured red?

A child responds

One-tenth.

Have a child write the fraction on the easel. Remind the children that the 10 tells the total number of equal parts and the one tells the number of parts we are talking about. Ask

Can anyone write the fraction one-tenth in another way?

Have a child write *0.1.*

Dicuss that the zero to the left of the decimal point tells that there are zero whole objects, and that the numeral to the right of it tells that there is one-tenth of a whole object. Read the number aloud.

Zero decimal one. That is the name of the numeral 0.1. It is another name for one-tenth and the numeral $\frac{1}{10}$*. The part of the pie that is coloured red shows one-tenth and zero decimal one. These are all ways of representing the same number.*

2

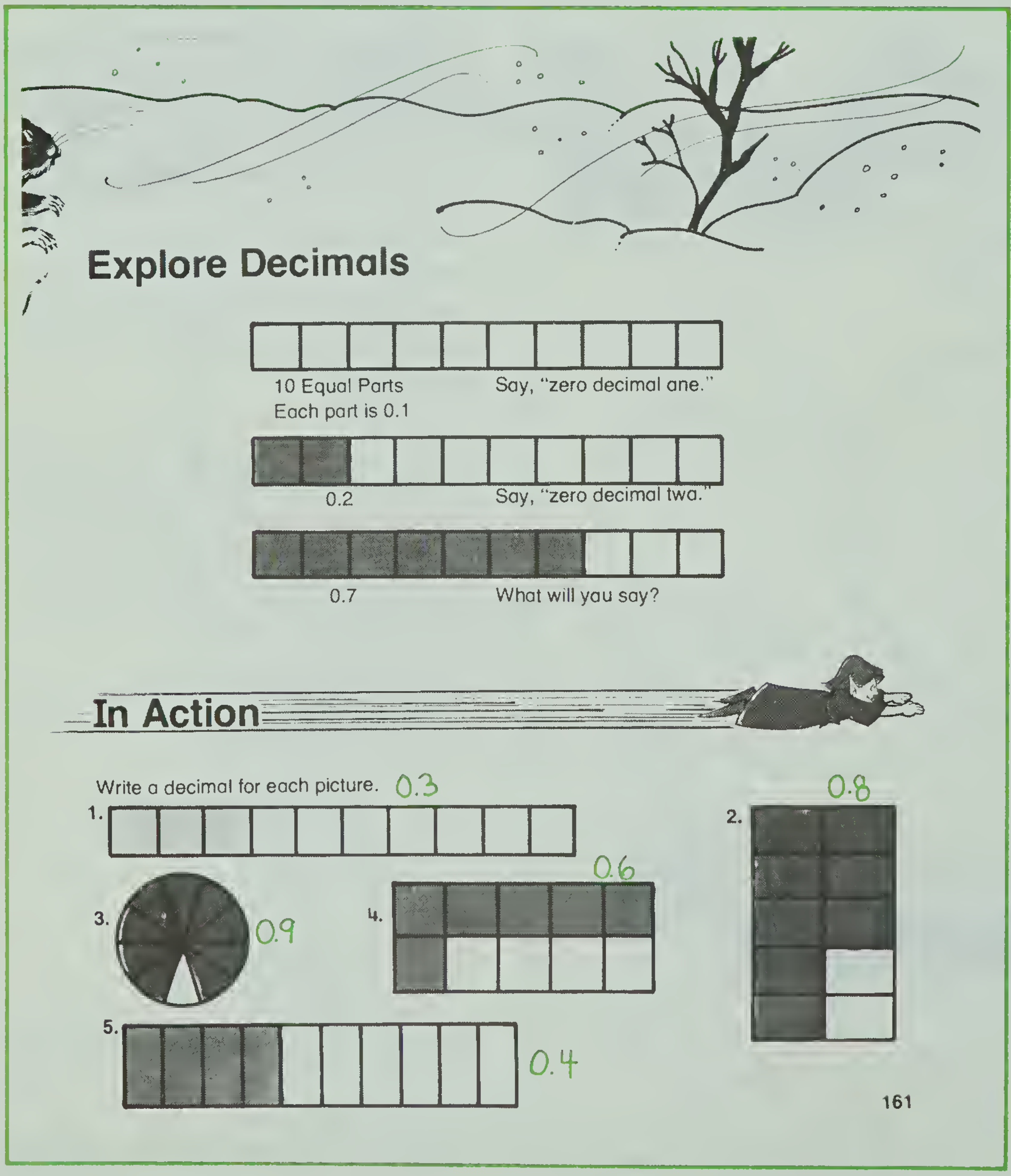
Show the fractional pie with six-tenths coloured red. Have a child tell the number of parts and the number of coloured parts. Ask

Can we write a decimal to represent the six equal parts of this pie? How?

Have a child write the decimal on the easel and tell its name.

0.6 Zero decimal six.

Repeat the procedure for introducing the decimals 0.2 to 0.9.



Explore Decimals

10 Equal Parts
Each part is 0.1

Say, "zero decimal one."

0.2

Say, "zero decimal two."

0.7

What will you say?

In Action

Write a decimal for each picture. 0.3

1.

2. 0.8

3. 0.9

4. 0.6

5. 0.4

161

3

Place all the fractional pies in the centre of the working area. Write 0.5 on the easel. Have a child say the decimal's name, reading

Zero decimal five.

Have the child pick out the pie that represents the decimal and show it to the group. Repeat for other decimals to 0.9.

4

Distribute sheets of 2 cm graph paper. Have the children cut a strip of 10 squares, shade in one square, glue the strips in their notebooks and label them *0.1 zero decimal one.* Have the children continue the activity, representing and labelling the decimals 0.2 to 0.9.

5

Distribute copies of Program Master 33 and lightweight cardboard. Have pairs of children make models for decimals to 0.9. Then one child names or writes a decimal and the other points to the equivalent model. Reversing roles, a child points to a model and the other child names and writes the decimal.

6

Say a decimal.

Zero decimal 8.

Have a child record it on the easel. Repeat for each remaining decimal between 0.1 and 0.9.

Written and Other Activities

☐

mathways 3, page 161

Before assigning the In Action exercise, discuss the examples.

☐ ☐

Have the children draw a picture to show one of the decimals to 0.9 and label it. Display pictures representing the same decimal together so that the children can see different pictorial representations and compare them.

☐ ☐ ☐

Display the fractional pies for 0.1 to 0.9. Eliciting the participation of the children, write the fraction and the decimal for each on the easel. Then have the children write the fraction that represents each of the pictures on page 161. Remind the children that the decimal and the fraction are equivalent ways of representing the picture numerically.

For Your Notes

Unit 2 Section 11 Lesson 2

Exploring Decimals: Whole Numbers and Decimals to 9.9

Materials

- coloured fractional pies for whole numbers to nine and decimals to 0.9: Program Masters 32 and 33
- for each child
  - copies of Program Masters 19, 32 and 33
  - lightweight cardboard
  - glue
  - pair of scissors

Lesson

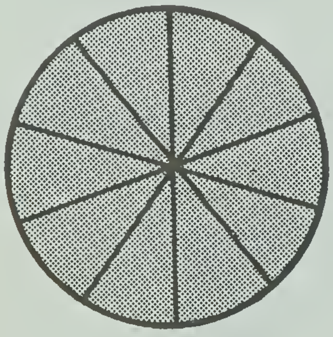
1

Seat the children around the working area. Display the fractional pie for 0.4. Have one child name the decimal and another write it on the easel. Repeat for other decimals from 0.1 to 0.9.

2

Display a whole fractional pie coloured red. Ask

What number do you think this pie shows?

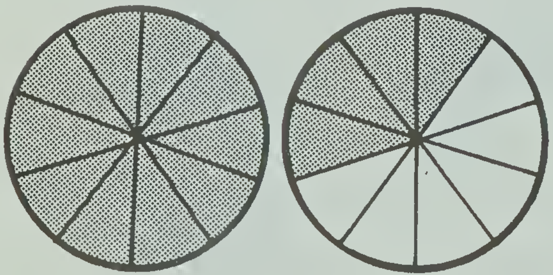


Eliciting the participation of the children, show that when ten-tenths are coloured red the fractional pie represents the whole number one.

3

Show fractional pies for 1.4. Write 1.4 on the easel, saying

One decimal four.



Explain that the number to the left of the decimal point means one whole object, and the number to the right of it means four-tenths of an object. Discuss a familiar situation, such as two pies or pizzas, the second with tenths eaten.

4

Show fractional pies for decimals 1.1 to 9.9. Have children name the decimals and write them on the easel. Alternate the procedure, having children write the decimal, then read it.

5

Write several decimals between 1.1 and 9.9. on the easel. Have children select fractional pies to show each decimal.

Written and Other Activities

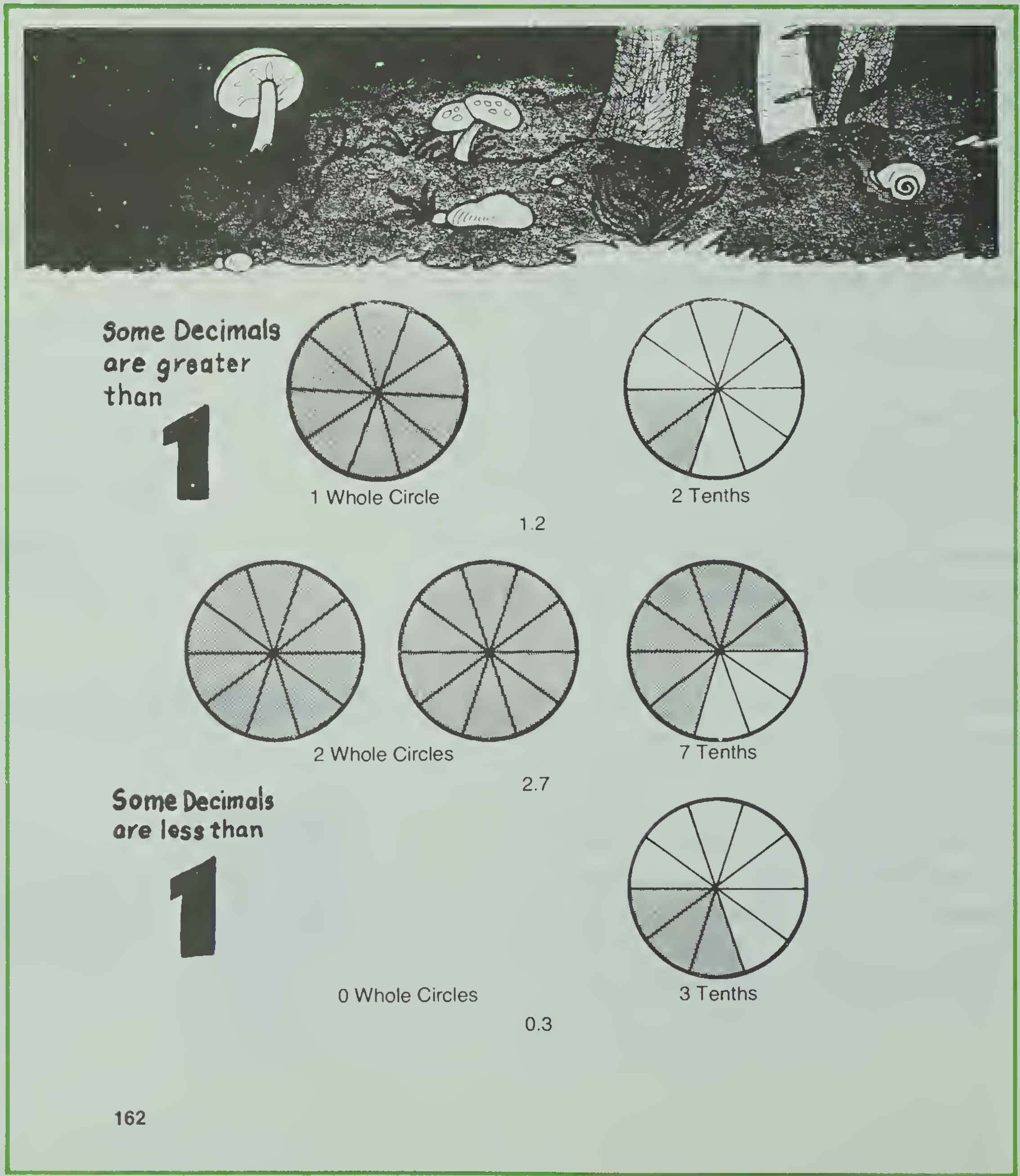
☐

mathways 3, pages 162, 163

Discuss the examples and illustrations, inviting children to read the decimals and providing a familiar context for wholes and fractions: chocolate bars, pies and so on. When the children have completed page 163, have several children explain how the illustration shows the decimal.

☐ ☐

Distribute copies of Program Master 19. Have the children cut strips of 10 squares and shade them in to illustrate several decimals to 9.9. Have the children glue the strips in their notebooks and label them.



Some Decimals are greater than 1

1 Whole Circle

2 Tenths

1.2

2 Whole Circles

7 Tenths

2.7

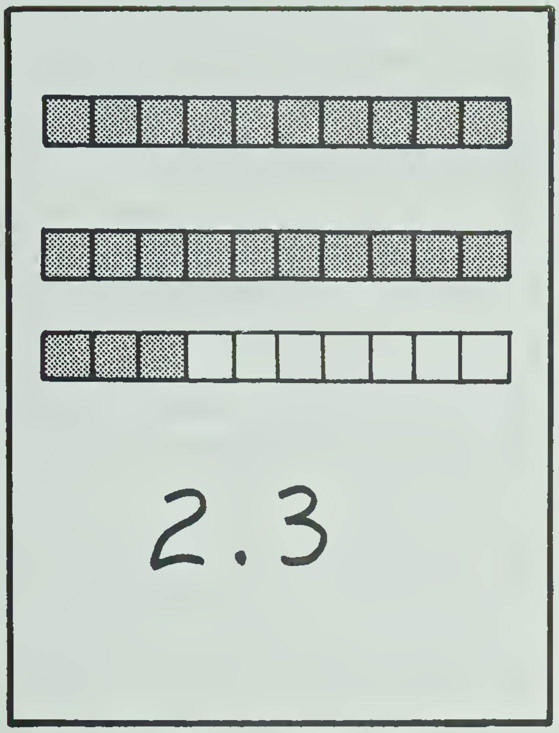
Some Decimals are less than 1

0 Whole Circles

3 Tenths

0.3

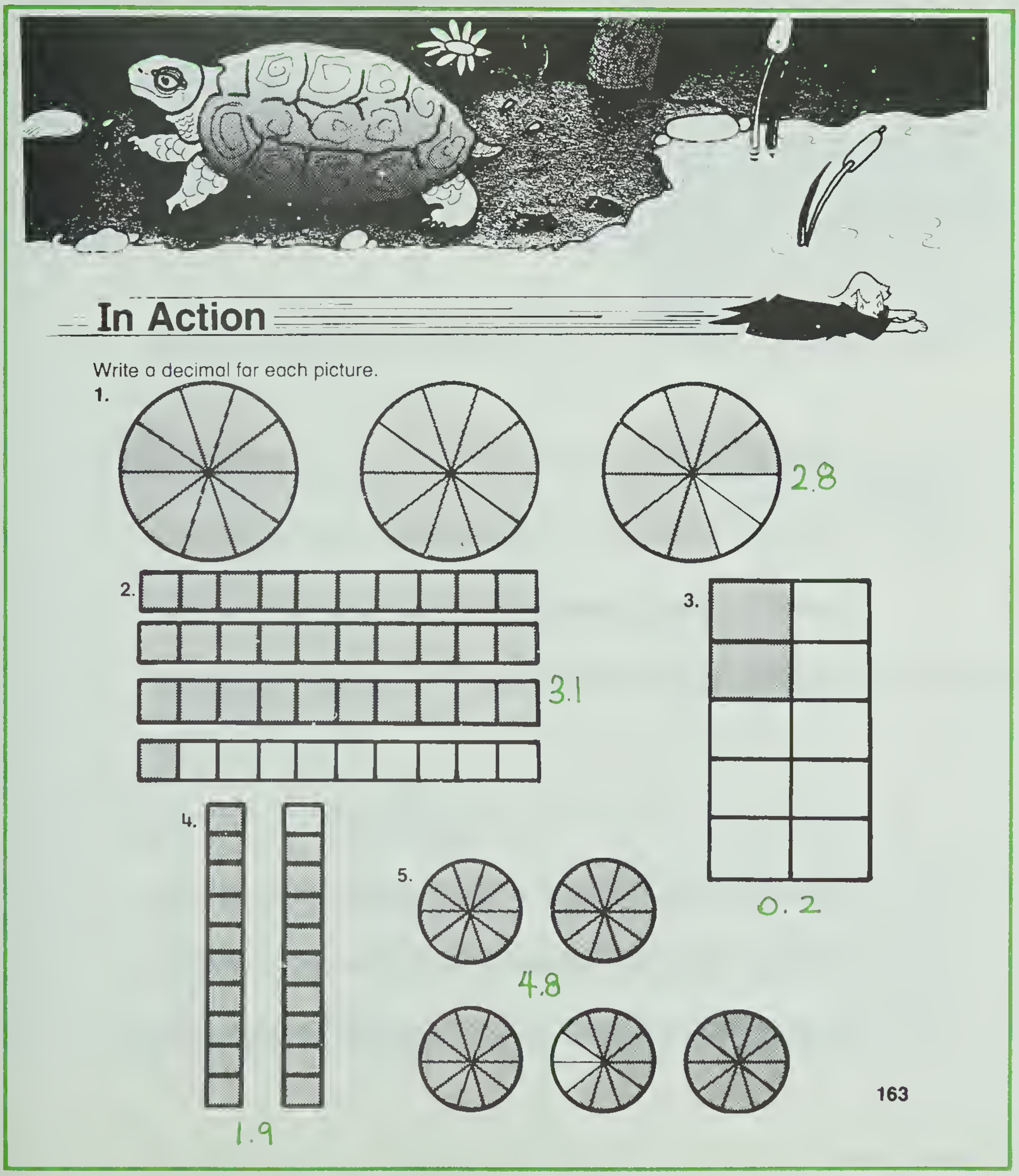
162



Alternatively, assign groups of decimals to groups of children and glue the resulting illustrations to construction paper. Have the children label each decimal illustration. Display the resulting chart in a prominent location.

☐ ☐ ☐

Distribute copies of Program Masters 32 and 33. Have the children work in pairs to construct models of decimals to 9.9. Then, one partner says and writes a decimal and the other chooses the corresponding model. The children alternate, the other child showing a model and the first child writing the decimal and reading it.



In Action

Write a decimal for each picture.

1. 2.8

2. 3.1

3. 0.2

4. 1.9

5. 4.8

163

For Your Notes

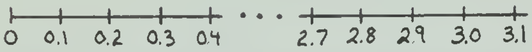
Unit 2 Section 11 Lesson 3
Exploring Decimals: Matching Decimals to Points on a Number Line

Materials
- display-size number lines, *see* **1** *and* **3**
- fractional pies to 9.9
- for each child
  - number lines: Program Master 30

Rationale
Relating decimals to points on a number line reinforces the concept of decimals and prepares children for comparing decimals that are less than and greater than one, presented in the next lesson.

Lesson
1

On the easel, draw and label a number line.



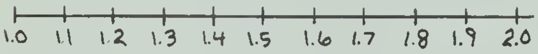
Gather the children around the number line. Point to each position as the children count aloud from 0 to 3.1.

2

Name a number between 0 and 3.1. Have a child point it out on the number line. Repeat, naming several numbers and involving different children. Include numbers 0, 1, 2, and 3.

3

Display another number line, prepared in advance.



Name a decimal.

One decimal eight.

Have a child point to the position representing 1.8 on the number line. Repeat, naming other numbers between 0 and 3.1.

Written and Other Activities
☐

mathways 3, page 164

Before assigning the In Action exercise, discuss the example and have a child explain how to complete the questions.

☐ ☐

Distribute copies of Program Master 30. Instruct the children to mark one number line to show tenths from 1.9 to 4.5, and another number line to show tenths from 6.8 to 9.4.

☐ ☐ ☐

Display a number line showing 0 to 9.9. Have one child display fractional pies for a decimal and another child point to the corresponding position on the number line. Repeat several times. Then reverse the procedure, having one child point to a decimal on the number line and the other display the appropriate fractional pies.

☐ ☐ ☐ ☐

Have the children form groups of five or six. Give a counting instruction.

Count forward from zero decimal one to three decimal two.

Relay fashion, group members count one decimal in the sequence aloud.

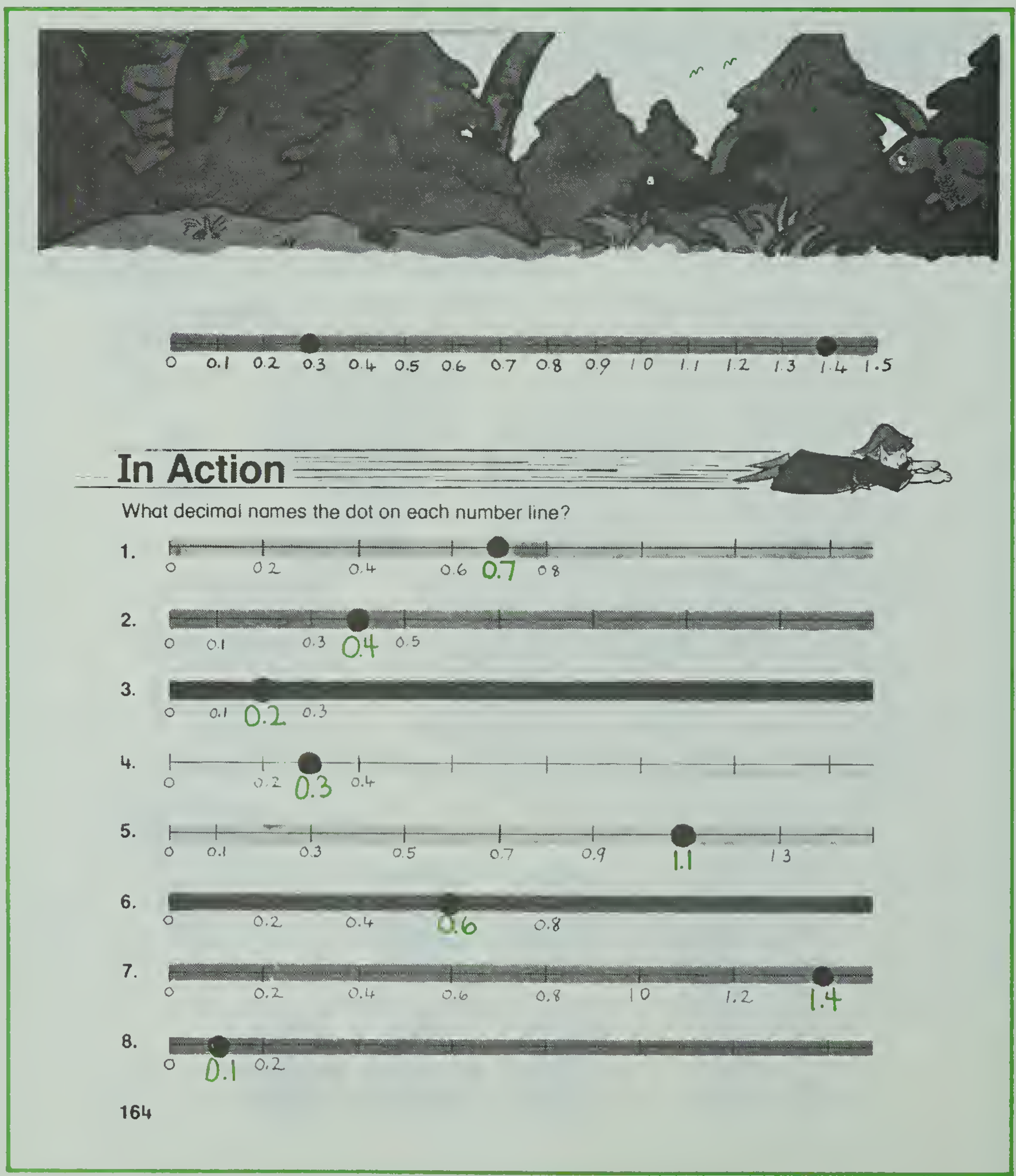
First child: *Zero decimal one.*

Second child: *Zero decimal two.*

Third child: *Zero decimal three.*

Give another counting instruction.

Count back from three decimal two.



In Action

What decimal names the dot on each number line?

1. 0 0.2 0.4 0.6 0.7 0.8
2. 0 0.1 0.3 0.4 0.5
3. 0 0.1 0.2 0.3
4. 0 0.2 0.3 0.4
5. 0 0.1 0.3 0.5 0.7 0.9 1.1 1.3
6. 0 0.2 0.4 0.6 0.8
7. 0 0.2 0.4 0.6 0.8 1.0 1.2 1.4
8. 0 0.1 0.2

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Unit 2 Section 11 Lesson 4

Greater Than, Less Than: Decimals Less than 1.0

Materials

- coloured fractional pies to 0.9
- display-size number line, *see* **3**
- for each child
  - – copy of stencil, *see* ☐ ☐ ☐ ☐
- for each pair
  - – two cubes marked 0.1, 0.2, 0.3, 0.4, 0.8, 0.9

Lesson

1

Gather the children around the easel. Write

6 ☐ 7 > <

Ask a child

Which of these numbers is greater?

Ask another child

Which of these symbols should we use to show that six is less than seven?

Have the child write the correct symbol between the numbers. Write other pairs of numbers and have children fill in the appropriate symbol to form complete number sentences.

7 ☐ 8
2 ☐ 3
5 ☐ 4
⋮

2

Place the coloured fractional pies in the centre of the working area. Write on the easel

0.6 ☐ 0.7 > <

Have children select the fractional pie that represents each decimal and show them to the group. Ask

Which of these has a greater number of tenths?

If that is so, which of these symbols should we use between zero decimal six and zero decimal seven?

Have the child who responds fill in the appropriate symbol. Draw a parallel with the whole numbers six and seven, saying

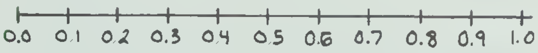
Since six is less than seven, zero decimal six is less than zero decimal seven.

This is one way of saying that six-tenths is less than seven-tenths.

Using other pairs of decimals, repeat the procedure.

3

Display a number line.



Write on the easel

0.8 ☐ 0.3 > <

Have a child point out the position of each decimal on the number line and fill in the appropriate symbol to complete the number sentence. Eliciting participation, discuss with the children how the number line helps when comparing numbers.

Written and Other Activities

☐

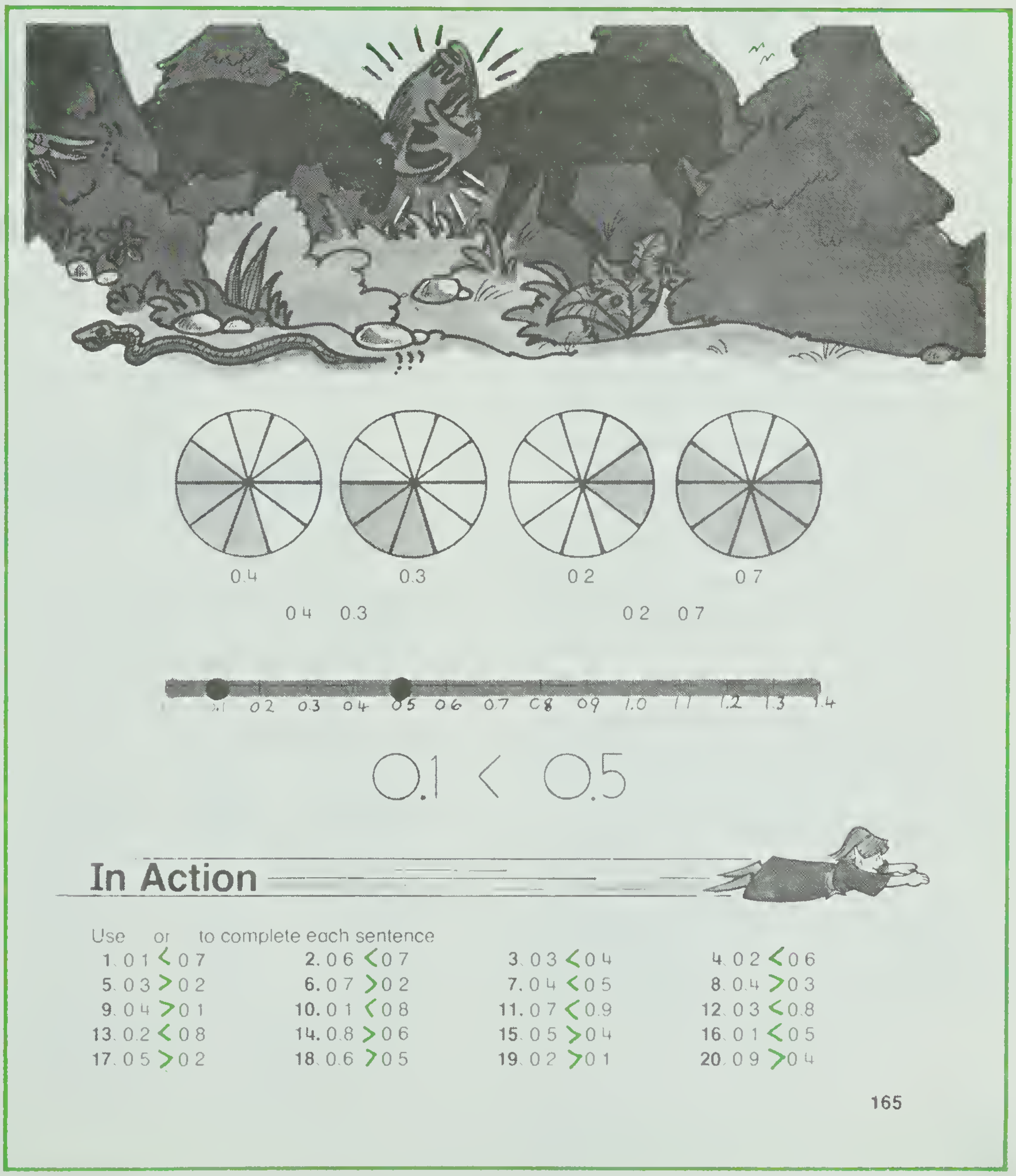
mathways 3, page 165

Before assigning the In Action exercise, have children count the tenths in each of the fractional pies shown and read the corresponding decimal. Discuss which of the pies shows the greater number of tenths and have children relate each pie to a corresponding position on the number line. Then have a child explain how to complete the number sentences.

☐ ☐

Have pairs of children ask each other greater than, less than questions.

Which is greater, zero decimal four or zero decimal seven?



0.1 < 0.5

In Action

Use or to complete each sentence

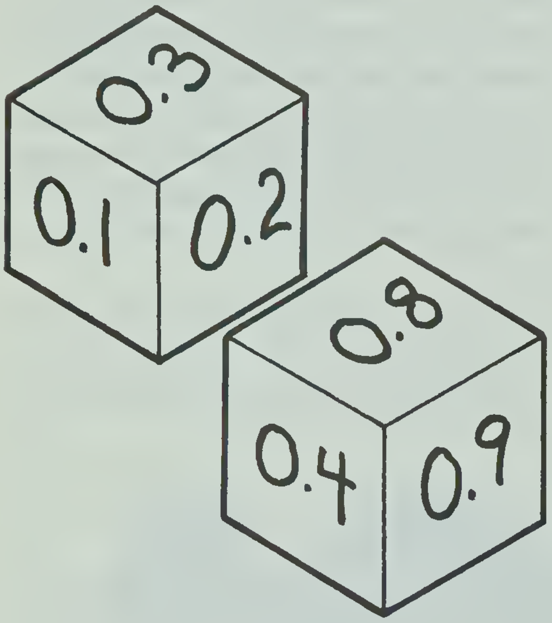
1. 0.1 < 0.7
2. 0.6 < 0.7
3. 0.3 < 0.4
4. 0.2 < 0.6
5. 0.3 > 0.2
6. 0.7 > 0.2
7. 0.4 < 0.5
8. 0.4 > 0.3
9. 0.4 > 0.1
10. 0.1 < 0.8
11. 0.7 < 0.9
12. 0.3 < 0.8
13. 0.2 < 0.8
14. 0.8 > 0.6
15. 0.5 > 0.4
16. 0.1 < 0.5
17. 0.5 > 0.2
18. 0.6 > 0.5
19. 0.2 > 0.1
20. 0.9 > 0.4

165

Have them check their answers on a number line or with a set of fractional pies.

□ □ □

Have pairs of children play a game with a pair of specially marked cubes.



Each player tosses a cube. The player whose cube shows the greater decimal is the first caller. If both players toss the same decimal, they toss the cube again. Then, the players toss their cubes simultaneously and the caller says *Greater* or *Less.* If the caller says *Greater* and his or her cube shows 0.8, while the other player's cube shows 0.4, the caller scores a point. If both players' cubes show 0.8, no one scores. Players take turns at being the caller, and the first player to score 10 points is the winner.

□ □ □ □

As enrichment and to prepare children for adding and subtracting decimals, distribute copies of the following stencil and have the children complete it.

The decimal one-tenth less than	Decimal	The decimal one-tenth greater than
	0.2	
	0.3	

□ □ □ □ □

mathways 3 Plus Workbook page 49

For Your Notes

For Your Notes

Unit 2 Section 11 Lesson 5

Exploring Decimals: Adding

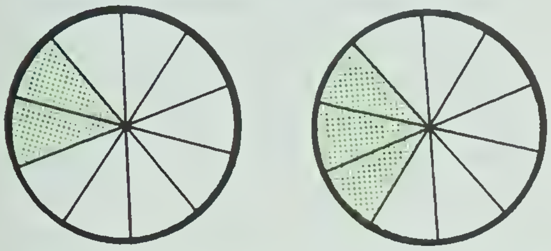
Materials

- four white fractional pies
- one red fractional pie, cut into tenths
- die marked 0.1, 0.1, 0.2, 0.2, 0.3, 0.4
- die marked 0.4, 0.4, 0.5, 0.5, 0.6, 0.6

Lesson

1

Place red sections on each of two white fractional pies to show decimals whose sum is less than one. Ask for the decimal represented by each.

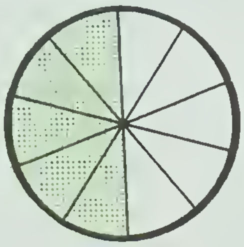


Write the addition sentence on the easel.

Add.
0.2
+0.3

Demonstrate the addition by combining the red tenth sections of the fractional pies on one fractional pie. Ask for the number of tenths altogether. Record the sum.

Add.
0.2
+0.3
0.5



Repeat this many times for sums less than one.

2

Write an addition question for three decimals with a sum less than one.

Add.
0.1
0.5
+0.2

Have children place red tenth sections on a fractional pie to represent each decimal.

Then have a child demonstrate combining the decimals by placing all the red tenth sections from these fractional pies on one fractional pie.

Ask for the decimal represented by this and record the sum.

3

Write addition questions with sums less than one on the easel and have children add without using fractional pies. Use questions with two decimals and with three decimals.

Written and Other Activities

☐

mathways 3, page 166

☐ ☐

Have the children draw fractional pies to show some of the addition questions on mathways 3, page 166. They draw a fractional pie for each addend and loop the pies for the sum. Have them write the addition sentence.

☐ ☐ ☐

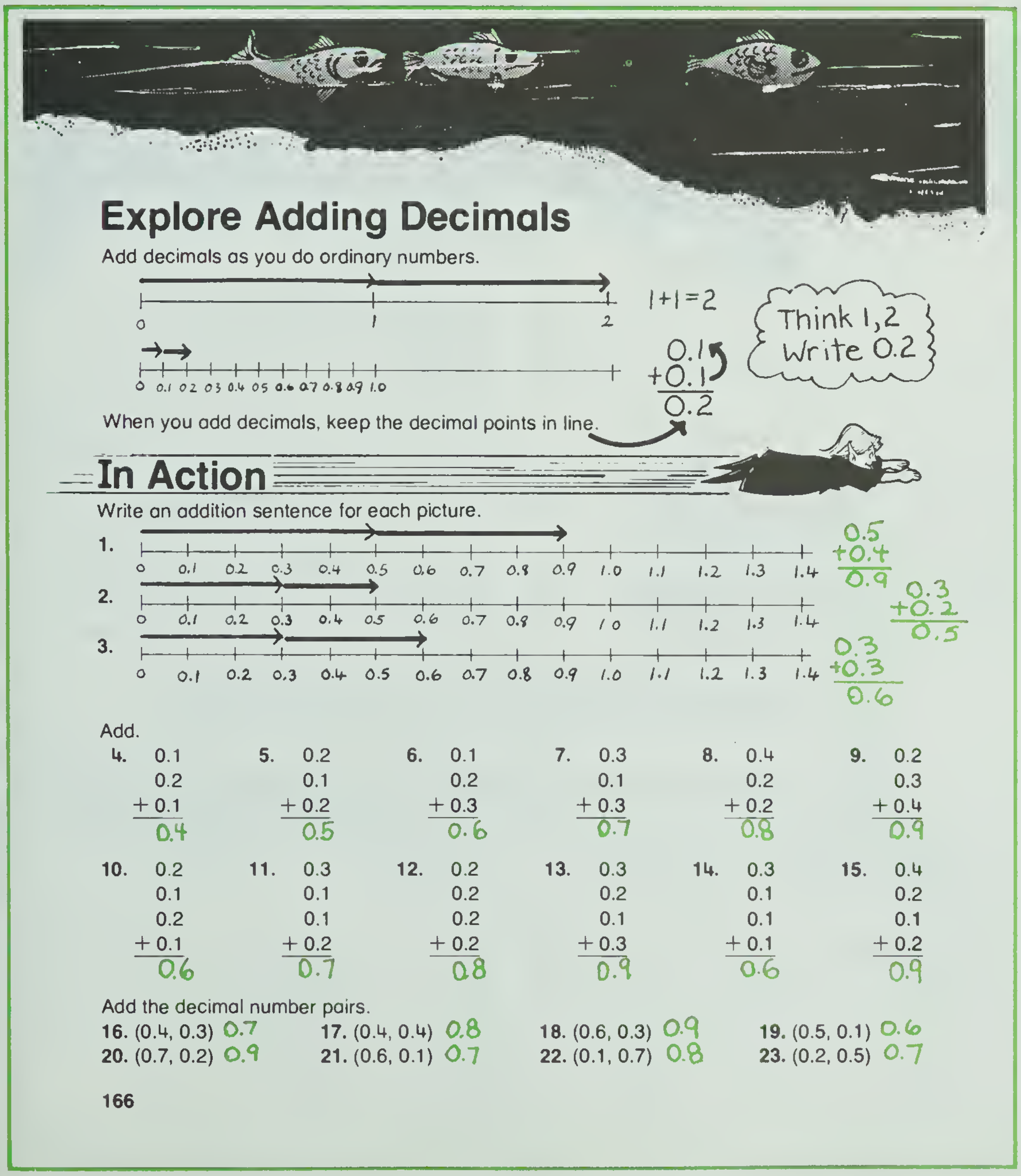
Mark a die with 0.1, 0.1, 0.2, 0.2, 0.3 and 0.3 and another die with 0.4, 0.4, 0.5, 0.5, 0.6 and 0.6. Children play in groups of three. The first child rolls the dice. The second child selects the fractional pie pieces for the decimals on the upturned faces of the dice and combines them to show the sum. The third child writes the appropriate addition sentence. Then the children compare the fractional pie pieces and the addition sentence. The children change roles for each toss of the dice.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 33

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 50



Explore Adding Decimals

Add decimals as you do ordinary numbers.

0.1
+0.1
0.2

When you add decimals, keep the decimal points in line.

In Action

Write an addition sentence for each picture.

1. 0.5 +0.4 0.9
2. 0.3 +0.2 0.5
3. 0.3 +0.3 0.6

Add.

4.	5.	6.	7.	8.	9.
0.1 0.2 + 0.1 0.4	0.2 0.1 + 0.2 0.5	0.1 0.2 + 0.3 0.6	0.3 0.1 + 0.3 0.7	0.4 0.2 + 0.2 0.8	0.2 0.3 + 0.4 0.9

10.	11.	12.	13.	14.	15.
0.2 0.1 0.2 + 0.1 0.6	0.3 0.1 0.1 + 0.2 0.7	0.2 0.2 0.2 + 0.2 0.8	0.3 0.2 0.1 + 0.3 0.9	0.3 0.1 0.1 + 0.1 0.6	0.4 0.2 0.1 + 0.2 0.9

Add the decimal number pairs.

16. (0.4, 0.3) 0.7
17. (0.4, 0.4) 0.8
18. (0.6, 0.3) 0.9
19. (0.5, 0.1) 0.6
20. (0.7, 0.2) 0.9
21. (0.6, 0.1) 0.7
22. (0.1, 0.7) 0.8
23. (0.2, 0.5) 0.7

166

Unit 2 Section 11 Lesson 6

Byway: Adding Decimal Tenths to Make One

Materials

- uncoloured fractional pie: Program Master 33
- red fractional pie, cut into tenths
- for groups of four
  - set of cards, *see mathways 3, page 167*

Rationale

The Byway page challenges the children to apply their skill in adding decimals in a game context. Lesson 8 builds on the concept of tenths and extends it to include ten-tenths, or one whole.

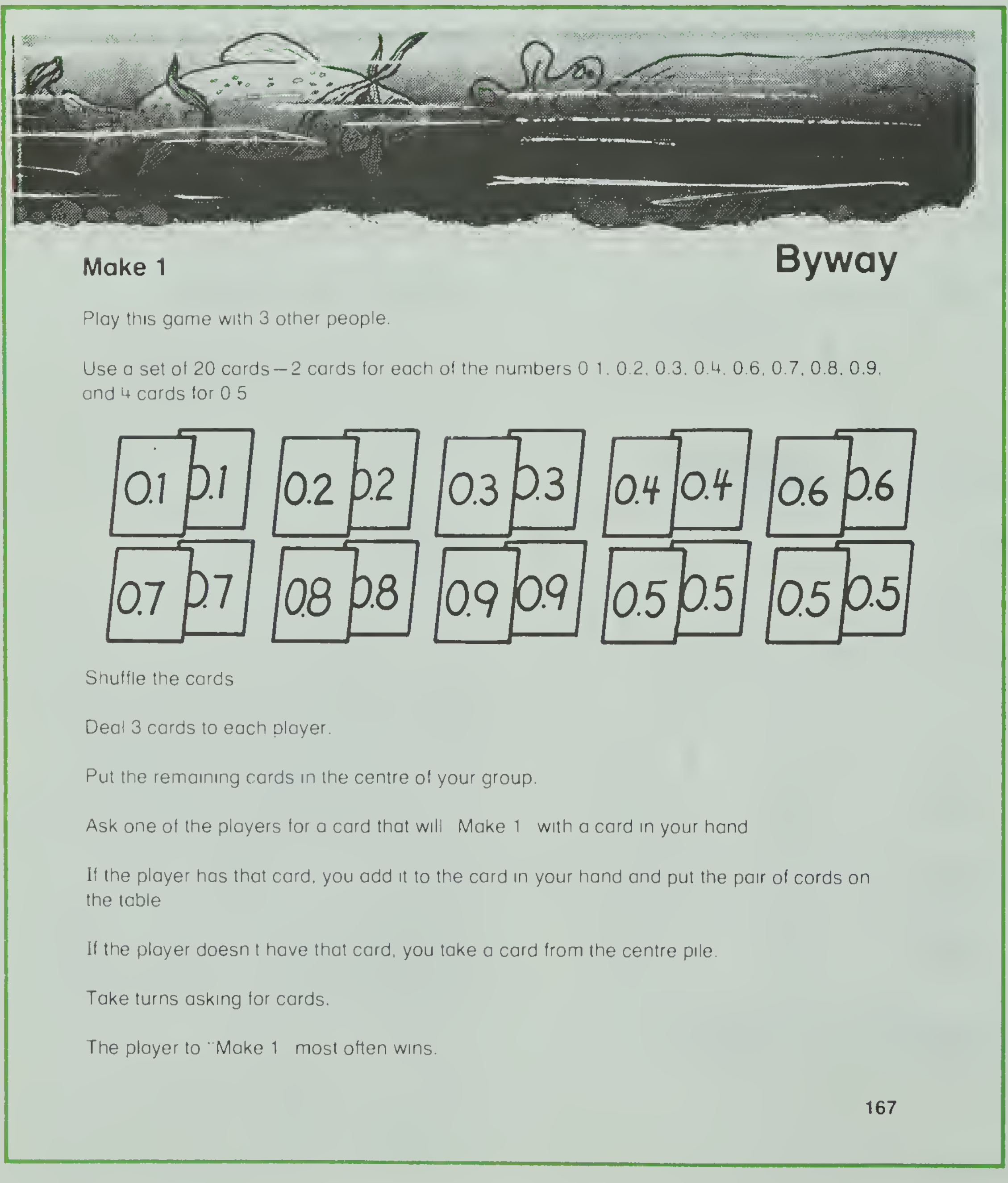
Lesson

1

Gather the children around the working area. Illustrate 0.1 by placing one red tenth on the uncoloured fractional pie. Ask a child to name the decimal represented and write it on the easel. Add another red tenth to the pie and have a child identify and record 0.2. Continue the procedure until 0.9 has been identified and recorded. Then, placing the last tenth on the pie, ask

How many tenths are on the pie now?
Do you agree that 10 tenths of a pie makes one whole pie?
What number can we record to show 10 tenths of this pie?

Manage the ensuing discussion to show that since 10 equal parts of a pie make up one whole, the pie can be represented by the numeral 1.


0.1
0.1
0.2
0.2
0.3
0.3
0.4
0.4
0.6
0.6
0.7
0.7
0.8
0.8
0.9
0.9
0.5
0.5
0.5
0.5

Make 1

Byway

Play this game with 3 other people.

Use a set of 20 cards—2 cards for each of the numbers 0.1, 0.2, 0.3, 0.4, 0.6, 0.7, 0.8, 0.9, and 4 cards for 0.5

Shuffle the cards.

Deal 3 cards to each player.

Put the remaining cards in the centre of your group.

Ask one of the players for a card that will "Make 1" with a card in your hand.

If the player has that card, you add it to the card in your hand and put the pair of cards on the table.

If the player doesn't have that card, you take a card from the centre pile.

Take turns asking for cards.

The player to "Make 1" most often wins.

167

2

Place four red tenths on the fractional pie. Write on the easel

4 tenths

Have a child write the decimal that means four-tenths. Ask how many more tenths are needed to make one whole pie. Add six red tenths to the pie and record *6 tenths*. Have a child write the corresponding decimal. Explain that since four-tenths and six-tenths cover the whole pie the fact can be recorded in a number sentence. Write on the easel

0.4 + 0.6 = 1.0

Illustrate other pairs of decimals and repeat the procedure.

0.1 + 0.9 = 1.0
0.2 + 0.8 = 1.0
0.3 + 0.7 = 1.0

3

Write 0.7 on the easel and ask a child what decimal is needed to make one. Repeat several times for different decimals.

Written and Other Activities

☐

mathways 3, page 167

Divide the class into groups of four children.

Distribute the card sets. Be prepared to assist in clarifying the rules as the children play the game.

☐ ☐

Have the children write and draw pictures to illustrate all the pairs of decimal tenths with a sum of one.

☐ ☐ ☐

To compare pairs of decimal tenths with a sum of one and whole numbers with a sum of 10, have the children complete the following addition questions:

Add.

1 + 9	*0.1 + 0.9*
9 + 1	*0.9 + 0.1*
2 + 8	*0.2 + 0.8*
8 + 2	*0.8 + 0.2*
5 + 5	*0.5 + 0.5*

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 51

Unit 2 Section 11 Lesson 7

Exploring Decimals: Subtracting

Materials

- uncoloured fractional pie: Program Master 33
- red fractional pie cut into tenths
- die marked 0.6, 0.6, 0.7, 0.8, 0.9, 0.9
- die marked 0.1, 0.2, 0.3, 0.4, 0.4, 0.5

Lesson

1

Seat the children around the working area. Placing red tenths on an uncoloured fractional pie, illustrate a decimal. Ask a child to name the decimal.

Write a subtraction question on the easel.

Subtract.

0.6
−0.2

Demonstrate subtracting by taking away two red tenths. Ask a child *How many tenths are there now?* Have the child record the difference under the question

0.6
−0.2
0.4

Repeat the procedure, illustrating many other decimal subtraction questions and involving different children.

2

Write a subtraction question on the easel.

Subtract.

0.8
−0.4

Invite a child to represent the minuend by placing red tenths on the fractional pie. Then, have another child take four tenths away to illustrate the subtrahend. Ask the children how many tenths are left. Have a child record the difference.

Subtract.

0.8
−0.4
0.4

Repeat several times.

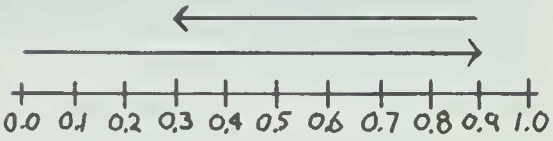
3

Draw a number line on the easel, marking decimals 0 to 0.9. Write a subtraction question.

Subtract.

0.9
−0.6

Draw an arrow to represent the minuend, and another arrow to show the subtrahend.



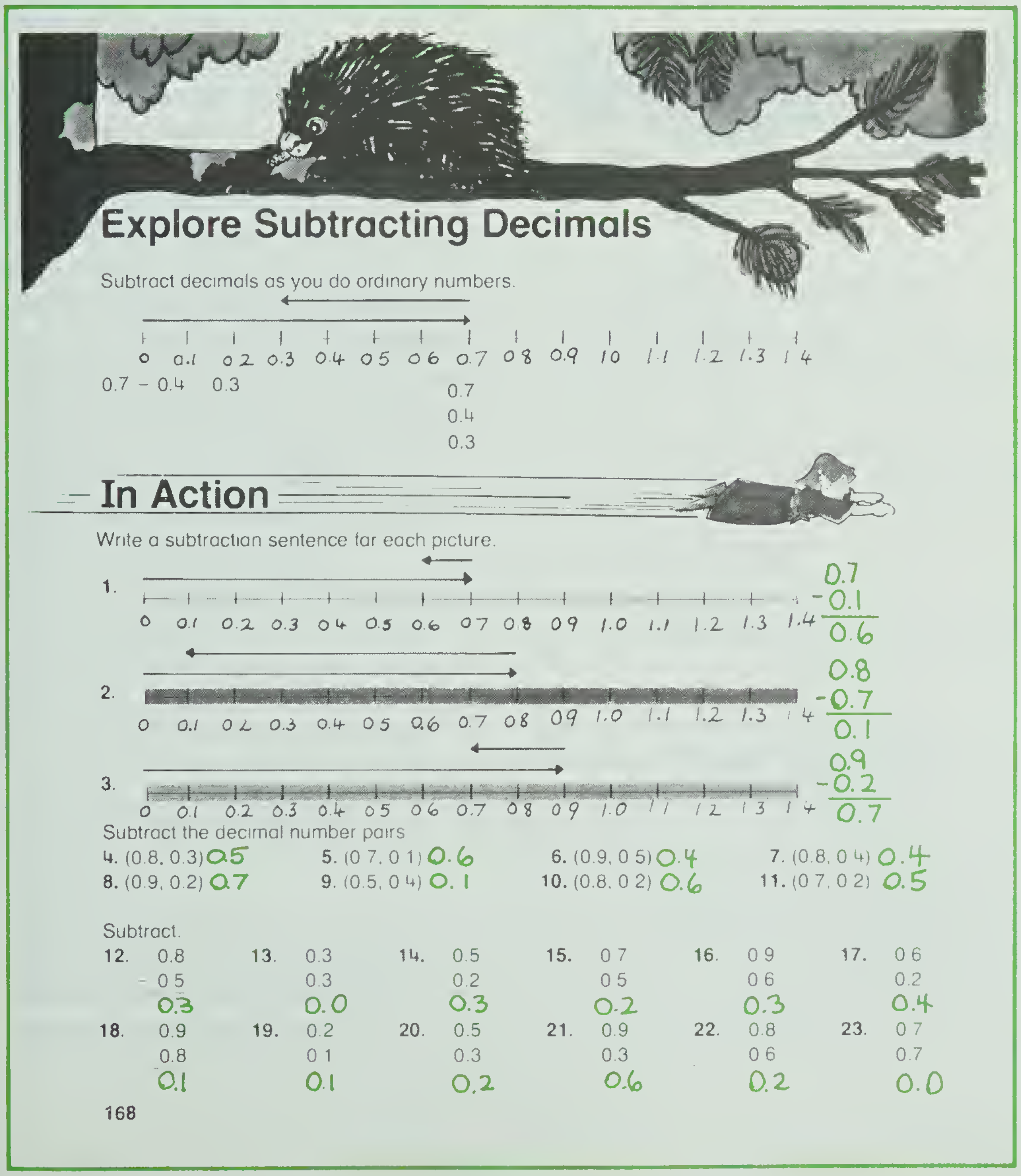
Emphasize the direction of the arrows. Remind the children that the arrow pointing to the right represents the greater number and the second arrow represents the number being taken away and the difference. To confirm this, have a child count back from 0.9 to the position where the arrow stops. Write the difference under the question.

0.9
−0.6
0.3

Have children suggest decimals less than one for subtraction questions. Have them record the question, draw the arrows on the number line and count back to the difference.

4

Write subtraction questions on the easel and have children subtract without using fractional pies or number lines.



Explore Subtracting Decimals

Subtract decimals as you do ordinary numbers.

0.7 − 0.4   0.3

0.7
0.4
0.3

In Action

Write a subtraction sentence for each picture.

1. 0.7 −0.1 0.6
2. 0.8 −0.7 0.1
3. 0.9 −0.2 0.7

Subtract the decimal number pairs

4. (0.8, 0.3) 0.5
5. (0.7, 0.1) 0.6
6. (0.9, 0.5) 0.4
7. (0.8, 0.4) 0.4
8. (0.9, 0.2) 0.7
9. (0.5, 0.4) 0.1
10. (0.8, 0.2) 0.6
11. (0.7, 0.2) 0.5

Subtract.

12. 0.8	**13.** 0.3	**14.** 0.5	**15.** 0.7	**16.** 0.9	**17.** 0.6
− 0.5	0.3	0.2	0.5	0.6	0.2
0.3	0.0	0.3	0.2	0.3	0.4
18. 0.9	**19.** 0.2	**20.** 0.5	**21.** 0.9	**22.** 0.8	**23.** 0.7
0.8	0.1	0.3	0.3	0.6	0.7
0.1	0.1	0.2	0.6	0.2	0.0

168

5

Write

(5, 2)

on the easel.

Ask a child for the difference between the pair of numbers.

Then write *(0.5, 0.2)*.

Explain that when subtracting decimals, pairs of numbers are used in the same way as when subtracting whole numbers. Ask a child for the difference and record it. Write other decimal pairs of numbers and have the children state the difference for each pair without writing the subtraction question.

Written and Other Activities

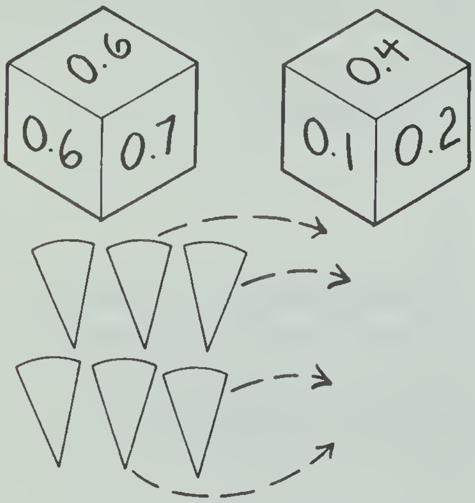
☐

mathways 3, page 168

Before assigning the In Action questions, have a child read and explain the example. Discuss the vertical and horizontal forms of the subtraction question. Discuss questions 4 to 11. Emphasize that pairs of numbers help us to find the difference quickly without writing the question.

☐ ☐

Have groups of three children use the specially marked dice and the fractional pie pieces to play a game. The first child rolls the dice. The second child selects the fractional pie tenths to represent the greater decimal, then takes away the number of tenths that represent the lesser decimal. The third child records the corresponding subtraction question. The three children compare the fractional tenths remaining and the subtraction question to find the difference. The children change roles after each round.



Subtract.

$$\begin{array}{r} 0.6 \\ -0.4 \\ \hline 0.2 \end{array}$$

☐ ☐ ☐

mathways 3 Practice Masters pages 34 and 35

☐ ☐ ☐ ☐

mathways 3 Tests 4A, 4B

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 52

For Your Notes

Unit 2 Section 11 Lesson 8

PROBLEM SOLVING

Using Decimals to Solve Word Problems

Materials

- uncoloured fractional pie
- two red fractional pies cut into tenths
- display-size number line

Rationale

This lesson provides the children with an opportunity to further explore decimals and extend their knowledge. In addition, it is a good vehicle for assessing the children's understanding of decimals and, thus, for determining the depth and detail required in following lessons.

Lesson

1

Gather the children together in the working area. Challenge them with the following problem:

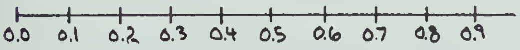
Sue ran 1.3 km and Sam ran 0.8 km. How much farther did Sue run?

Invite the children to suggest ways of solving the problem. Manage the ensuing discussion to show that it is necessary to compare 1.3 and 0.8 and decide which is greater. Ask the children what methods might be used to make the comparison, establishing that a number line or fractional pies would be of assistance. Then, using both methods to demonstrate, help the children solve the problem.

State a number of similar problems and repeat the procedure.

2

Draw a number line on the easel, marking 0.0 to 0.9.

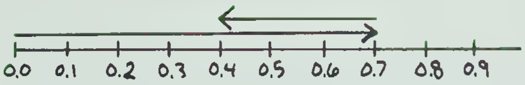


Write a subtraction question.

Subtract.

$$\begin{array}{r} 0.7 \\ \underline{-0.3} \end{array}$$

Draw an arrow to represent the minuend, and another arrow to represent the subtrahend.



Emphasize that the arrow pointing to the right shows the greater number and the arrow pointing to the left shows the number of units being taken away and the difference. Have a child read the decimal in the position where the second arrow stops and record it under the question.

$$\begin{array}{r} 0.7 \\ \underline{-0.3} \\ 0.4 \end{array}$$

Written and Other Activities

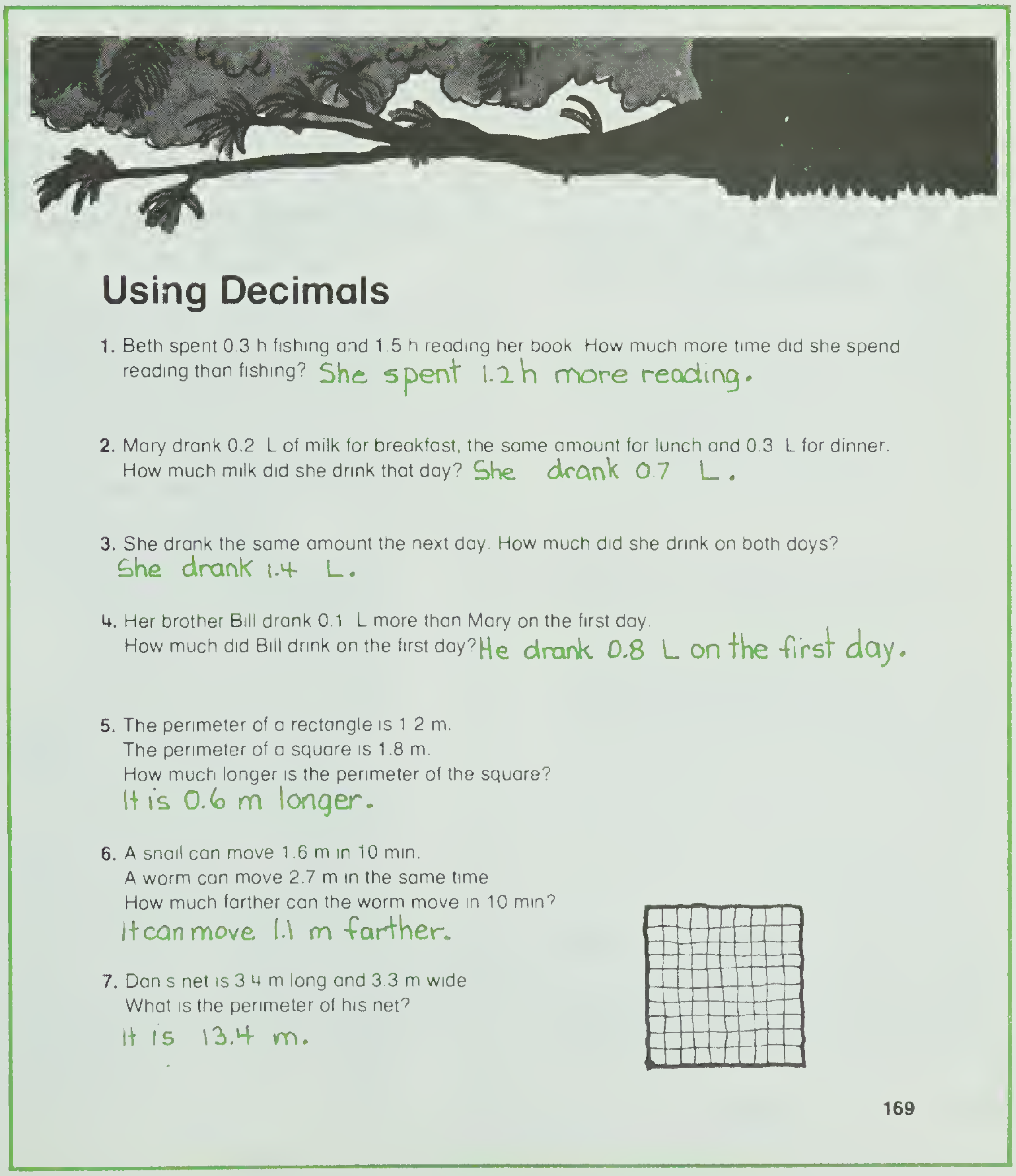
☐

mathways 3, page 169

Have different children read the problems and restate them in their own words. Discuss the steps involved in solving each problem and use fractional pies or number lines to show the solution.

☐ ☐

Present the children with a number of additional problems, similar to those on page 169. Allow those children who have a good grasp of the ideas to solve them independently, and help children who require it to find the solutions.



Using Decimals

1. Beth spent 0.3 h fishing and 1.5 h reading her book. How much more time did she spend reading than fishing? She spent 1.2 h more reading.

2. Mary drank 0.2 L of milk for breakfast, the same amount for lunch and 0.3 L for dinner. How much milk did she drink that day? She drank 0.7 L.

3. She drank the same amount the next day. How much did she drink on both days? She drank 1.4 L.

4. Her brother Bill drank 0.1 L more than Mary on the first day. How much did Bill drink on the first day? He drank 0.8 L on the first day.

5. The perimeter of a rectangle is 1.2 m. The perimeter of a square is 1.8 m. How much longer is the perimeter of the square? It is 0.6 m longer.

6. A snail can move 1.6 m in 10 min. A worm can move 2.7 m in the same time. How much farther can the worm move in 10 min? It can move 1.1 m farther.

7. Dan's net is 3.4 m long and 3.3 m wide. What is the perimeter of his net? It is 13.4 m.

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Unit 2 Section 11 Lesson 9

Recalling Decimals and Geometric Figures

Materials

- for groups of four
  - four gameboards; marked dice; cardboard tenths, *see* ☐ ☐
  - three decks of cards, *see* ☐ ☐ ☐
- set of geometric models

Rationale

The Retrace Your Steps page in the children's text reviews the concepts and skills taught in Section 11 and refreshes the children's memory of geometric figures. Their performance of the exercises isolates areas of difficulty and provides a basis for selecting appropriate activities from previous lessons for effectively reinforcing concepts and further developing necessary skills.

Lesson

1

Seat the children around the working area. Place a set of geometric figures in the centre. Then, say

I am thinking of a figure that has four sides that are equal in length. What is the figure?

Ask a child to select the appropriate figure from the set of figures and tell its name. Then invite individuals to provide the initial description for different figures for the others to identify.

2

Write a number sentence on the easel.

0.1 + 0.3 = ____

Ask

What is the sum of these decimals?

Have a child complete the number sentence.

Write

0.1 + 0.4 = ____

0.2 + 0.5 = ____

0.3 + 0.6 = ____

Have children complete the number sentences. Then write several subtraction sentences on the easel and have children complete them.

3

Write a sum on the easel.

0.7

Ask

What three decimal number pairs have a sum of zero decimal seven?

Have children who respond write the pairs on the easel.

(0.6, 0.1) (0.5, 0.2) (0.4, 0.3)

Write other sums on the easel and repeat the procedure.

4

Write a difference on the easel.

0.7

Ask

What three decimal number pairs have a difference of zero decimal seven?

Have the children record the pairs on the easel. Repeat.

Written and Other Activities

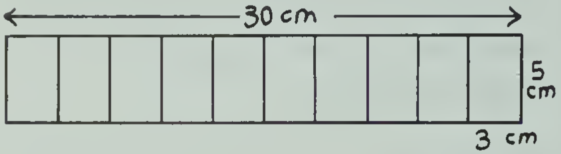
☐

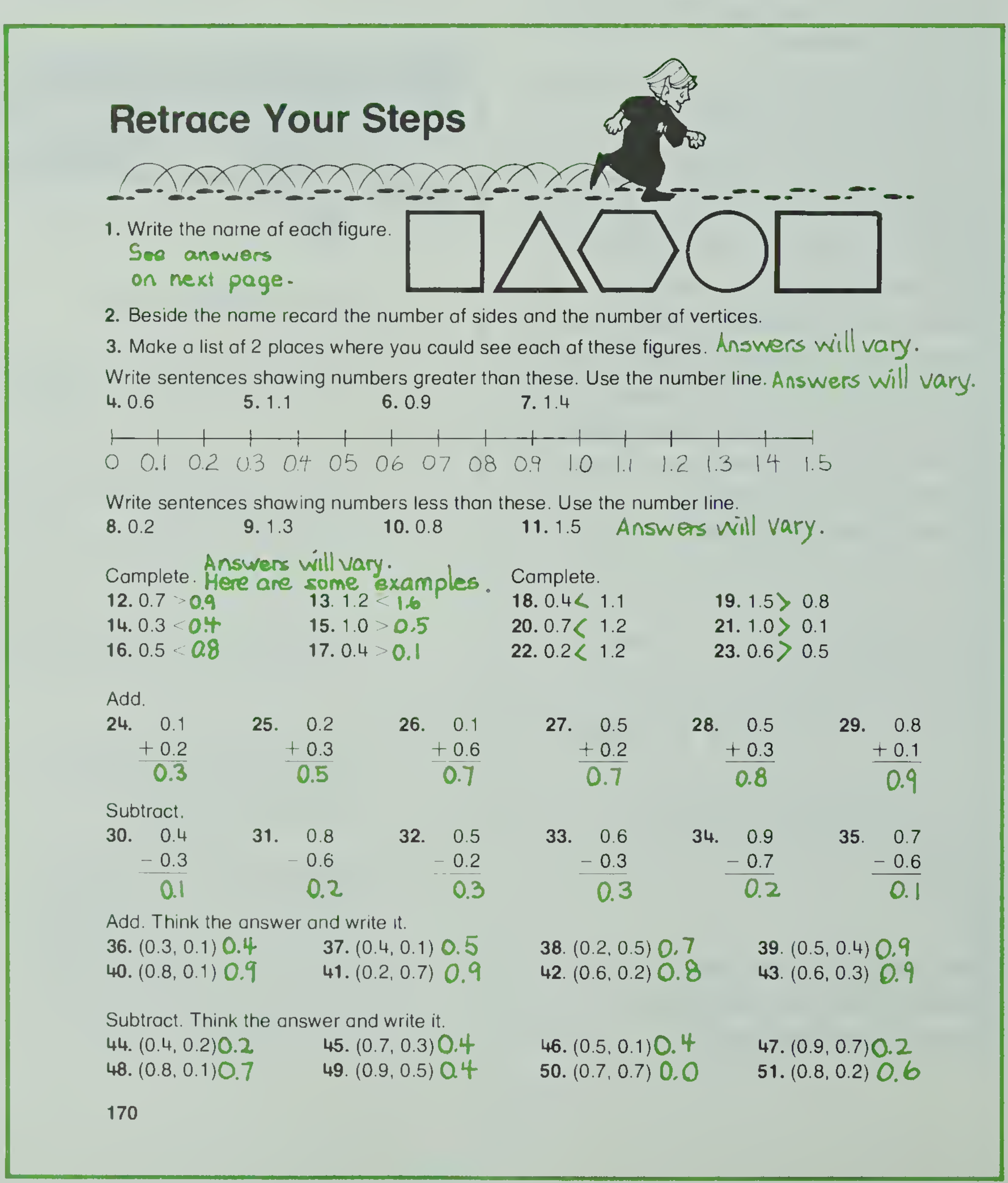
mathways 3, page 170

☐ ☐

To reinforce addition or subtraction of decimals, have groups of four children play a game.

Make four gameboards, one for each child.





Retrace Your Steps

1. Write the name of each figure.
See answers on next page.

2. Beside the name record the number of sides and the number of vertices.

3. Make a list of 2 places where you could see each of these figures. Answers will vary.

Write sentences showing numbers greater than these. Use the number line. Answers will vary.

4. 0.6 5. 1.1 6. 0.9 7. 1.4

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5

Write sentences showing numbers less than these. Use the number line.

8. 0.2 9. 1.3 10. 0.8 11. 1.5 Answers will vary.

Complete. Answers will vary. Here are some examples.

12. 0.7 > 0.9
14. 0.3 < 0.4
16. 0.5 < 0.8
13. 1.2 < 1.6
15. 1.0 > 0.5
17. 0.4 > 0.1

Complete.

18. 0.4 < 1.1
20. 0.7 < 1.2
22. 0.2 < 1.2
19. 1.5 > 0.8
21. 1.0 > 0.1
23. 0.6 > 0.5

Add.

24. 0.1 + 0.2 = 0.3
25. 0.2 + 0.3 = 0.5
26. 0.1 + 0.6 = 0.7
27. 0.5 + 0.2 = 0.7
28. 0.5 + 0.3 = 0.8
29. 0.8 + 0.1 = 0.9

Subtract.

30. 0.4 − 0.3 = 0.1
31. 0.8 − 0.6 = 0.2
32. 0.5 − 0.2 = 0.3
33. 0.6 − 0.3 = 0.3
34. 0.9 − 0.7 = 0.2
35. 0.7 − 0.6 = 0.1

Add. Think the answer and write it.

36. (0.3, 0.1) 0.4
37. (0.4, 0.1) 0.5
38. (0.2, 0.5) 0.7
39. (0.5, 0.4) 0.9
40. (0.8, 0.1) 0.9
41. (0.2, 0.7) 0.9
42. (0.6, 0.2) 0.8
43. (0.6, 0.3) 0.9

Subtract. Think the answer and write it.

44. (0.4, 0.2) 0.2
45. (0.7, 0.3) 0.4
46. (0.5, 0.1) 0.4
47. (0.9, 0.7) 0.2
48. (0.8, 0.1) 0.7
49. (0.9, 0.5) 0.4
50. (0.7, 0.7) 0.0
51. (0.8, 0.2) 0.6

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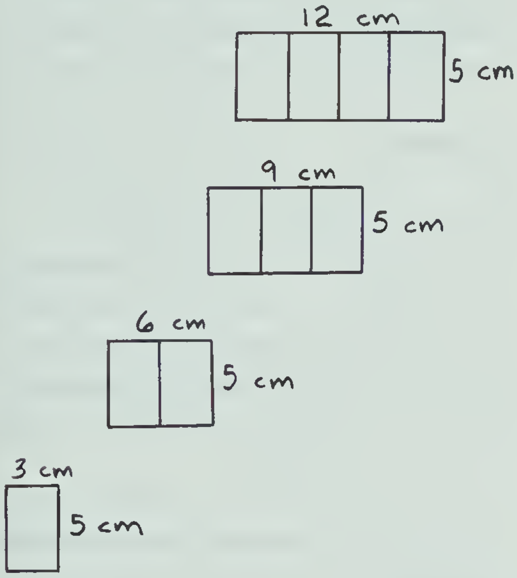
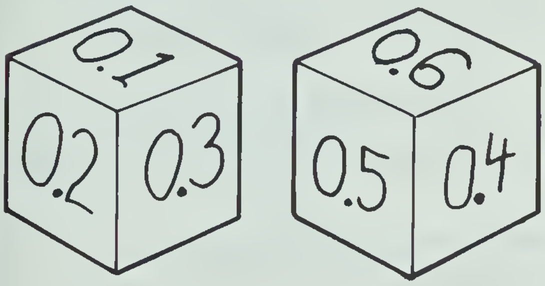
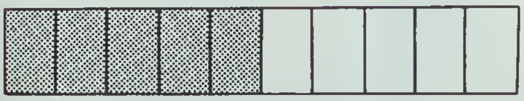
Cut 10 of each of the following pieces to represent 0.1, 0.2, 0.3 and 0.4.



Mark a pair of dice each with the decimals 0.1 to 0.6. Place the pieces representing the decimals in the centre of the playing area and give each player a gameboard. Specify whether the operation is addition or subtraction. Each player, in turn, rolls the dice, adds or subtracts the decimals and places the appropriate piece or pieces on the gameboard. For example, if the decimals on the faces of the dice are 0.2 and 0.3, the player places pieces that represent 0.5 on the board.



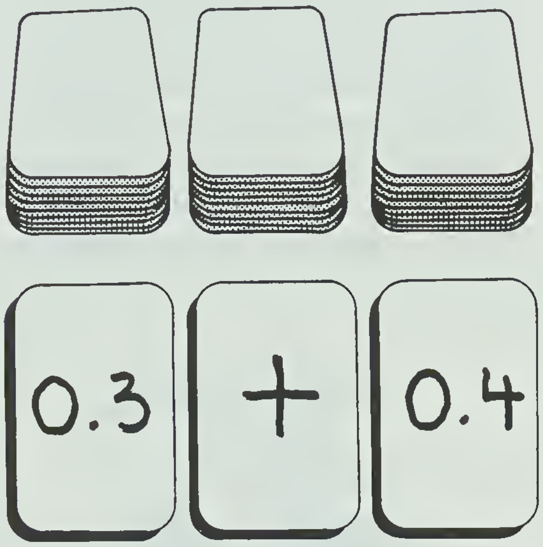


If the operation is subtraction, the player places a piece that represents 0.1 on the board. The first player to cover the gameboard is the winner.

☐ ☐ ☐

Make two decks of 20 cards, each deck containing two cards for each decimal from 0.1 to 0.9. Make a third deck containing 10 cards for each of the symbols +, −.

Place the three decks face down in a row, with the symbol cards in the middle. A player draws a card from each deck and arranges the cards to form a number expression.



The player who forms the expression states either the sum or the difference, as the case may be. A correct response wins a point for that player. The next player repeats the procedure. Play continues until the decks are depleted.

Additional Answers

1. Square – 4 sides
   – 4 vertices

   Triangle – 3 sides
   – 3 vertices

   Hexagon – 6 sides
   – 6 vertices

   Circle – 0 sides
   – 0 vertices

   Rectangle – 4 sides
   – 4 vertices

For Your Notes

Unit 2 Section 12 Lesson 1

Exploring Mass: Estimating, Measuring, Comparing

Materials

- for measuring centre
  - equal arm balances
  - bathroom scales
  - standard units of mass: 1 kg, 100 g, 20 g, 10 g, 5 g, 1 g
  - Plasticine
  - collection of objects: fruit, rocks, crayons and so on

Rationale

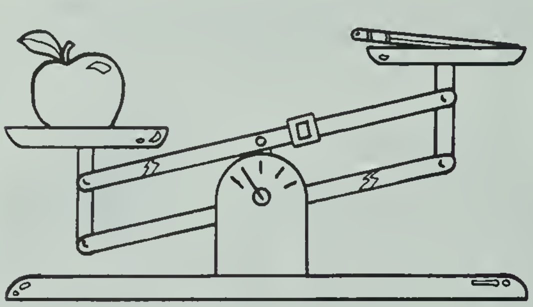
The basic unit for measuring mass is the gram; other units are multiples and are designated by adding prefixes to the word. All lessons dealing with the measurement of mass should begin with activities in which the children estimate the mass of an object. Estimating, then measuring, helps children develop an intuitive understanding of units of mass and apply their knowledge in situations in which measuring equipment is not available. Concrete materials and many opportunities to estimate and measure mass are important. It is helpful to set up a measurement centre containing equal arm balances, bathroom scales, standard units of mass ranging from 1 g to 1 kg, Plasticine for making balls having specific masses, and a variety of common objects to measure and compare. The children should be given the opportunity to use the equipment to explore before lessons begin. If the children have not had previous experience in measuring mass, they may benefit from trying some non-standard units of measurement. Erasers, books and quantities of Plasticine are a few examples.

Lesson

1

Gather the children around the measurement centre. Display several objects. Have a child select any two, hold one in each hand and estimate which object has the greater mass. Have the child place the objects on the arms of the balance.

Discuss how the balance shows which object has more mass. Repeat several times, using various objects in the classroom.



Written and Other Activities

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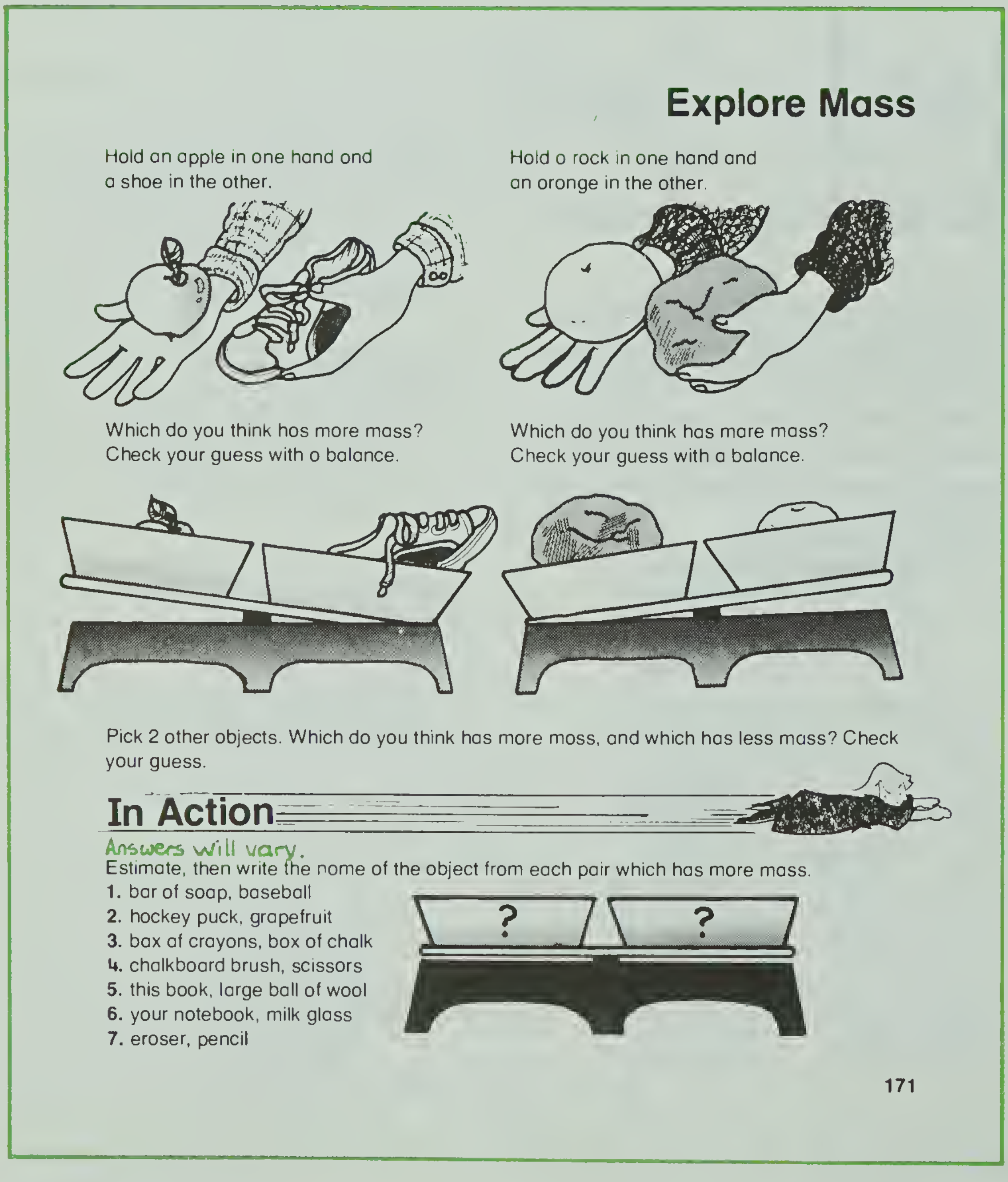
mathways 3, page 171

Using an equal arm balance may be new to some children. Extend the exploration activity at the top of the page so that they can investigate the mass of many objects before dealing with the In Action exercise.

☐ ☐

Ask each child in the group to collect three objects in the room and order the objects from greatest to least mass. Have them check the mass of each object on the balance to verify the order.



Explore Mass

Hold an apple in one hand and a shoe in the other.

Which do you think has more mass? Check your guess with a balance.

Hold a rock in one hand and an orange in the other.

Which do you think has more mass? Check your guess with a balance.

Pick 2 other objects. Which do you think has more mass, and which has less mass? Check your guess.

In Action

Answers will vary.

Estimate, then write the name of the object from each pair which has more mass.

1. bar of soap, baseball
2. hockey puck, grapefruit
3. box of crayons, box of chalk
4. chalkboard brush, scissors
5. this book, large ball of wool
6. your notebook, milk glass
7. eraser, pencil

Unit 2 Section 12 Lesson 2

Exploring Mass: Estimating and Measuring in Kilograms

Materials

- 1 kg masses
- equal arm balances
- bathroom scales
- empty containers with lids
- sand or gravel
- collection of objects, *see mathways 3, page 172*

Lesson

1

Gather the children around the measurement centre. Have each child hold a 1 kg unit of mass.

2

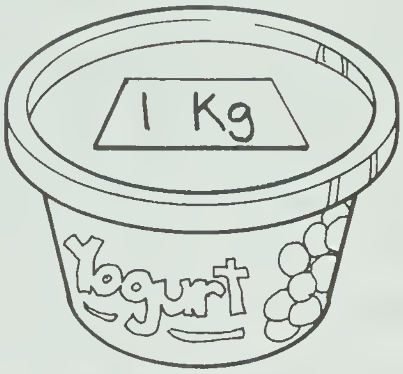
Ask the children to name objects in the classroom that are likely to have a mass of about 1 kg. Have the children check their estimates by placing each of the objects and the 1 kg mass on the equal arm balance.

3

Point out various objects in the measurement centre or in the room generally. Have children estimate whether each object has a greater mass than 1 kg or less mass. Have the children check their estimates on the balances.

4

Have the children use empty containers, such as cottage cheese or yogurt cartons, and sand, gravel or stones to make 1 kg units of mass. To make each 1 kg mass, the children place the standard unit on one arm of the balance and the empty container on the other arm, and fill the container until a balance has been achieved. Have the children tape the lid on each container, paint it and label it 1 kg.



Other masses, such as 100 g, 20 g, 10 g and so on, can be made in a similar fashion.

5

Have a child hold two 1 kg units of mass in one hand. Then ask the child to point out an object that is likely to have a mass between 1 kg and 2 kg. Have the child check the estimate on the equal arm balance. Repeat until each child has had an opportunity to estimate and check the mass of two or three objects.

6

Have each child estimate her or his own mass to the nearest kg and check the estimate on the bathroom scales. This information can be used to make a graph.

Written and Other Activities

☐

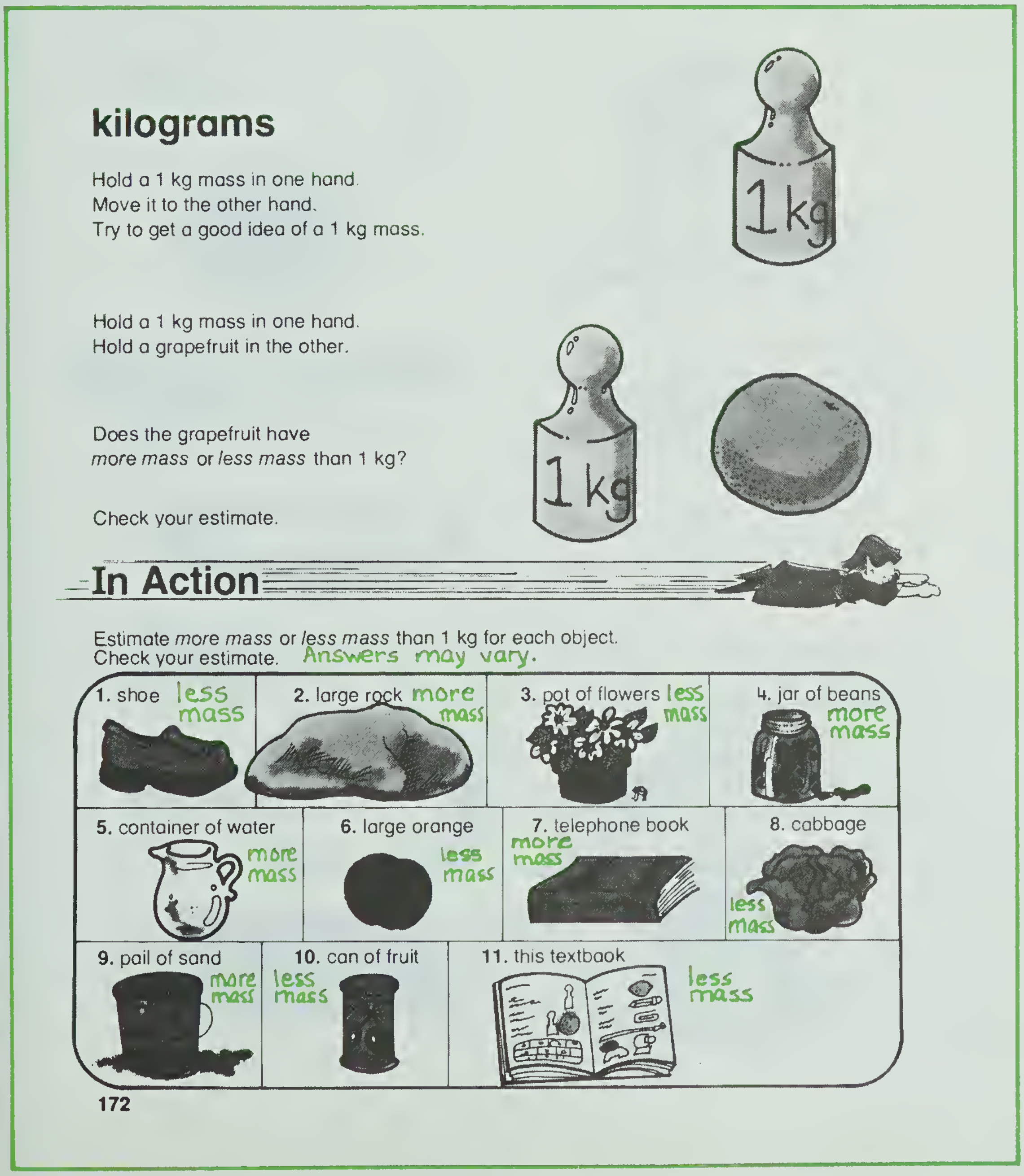
mathways 3, page 172

Emphasize estimating whether the mass of an object is greater or less than 1 kg. Checking an estimate on the equal arm balance allows children to apply their experience when making subsequent estimates.

☐ ☐

Have the children use the 1 kg units prepared earlier to complete a chart giving an estimate and the mass to the nearest kilogram of 10 objects.

Object	Estimate	Measurement



kilograms

Hold a 1 kg mass in one hand.
Move it to the other hand.
Try to get a good idea of a 1 kg mass.

Hold a 1 kg mass in one hand.
Hold a grapefruit in the other.

Does the grapefruit have *more mass* or *less mass* than 1 kg?

Check your estimate.

In Action

Estimate *more mass* or *less mass* than 1 kg for each object.
Check your estimate. Answers may vary.

1. shoe less mass
2. large rock more mass
3. pot of flowers less mass
4. jar of beans more mass
5. container of water more mass
6. large orange less mass
7. telephone book more mass
8. cabbage less mass
9. pail of sand more mass
10. can of fruit less mass
11. this textbook less mass

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Unit 2 Section 12 Lesson 3

Exploring Mass: Estimating and Measuring 100 g, 10 g and 1 g

Materials

- collection of objects: 1 g, 10 g, 100 g, *see mathways 3, pages 173, 174*
- Plasticine
- standard units of mass: 500 g, 200 g, 50 g, 20 g; ten 1 g, ten 10 g, ten 100 g
- plastic bags, ties, sand or gravel and labels

Lesson

1

Gather the children around the measurement centre. Write on the easel

one gram 1 g

Discuss grams, explaining that the gram and the kilogram are the two most common units used to measure mass. Then write

1 kg = *1000* g

and say

One Kilogram equals one thousand grams.

Ask a child to say how many 1 g units of mass it would take to balance the scales if 1 kg were placed on one arm.

2

Have each child hold a 1 g mass, then find an object that might have a mass less than 1 g. Such an object might be a leaf, a toothpick, a thumbtack or a paper clip. Have the children check their predictions by measuring the objects on the equal arm balance.

3

Write on the easel

ten grams 10 g

Have each child hold a 10 g mass. Then place a 10 g mass on arm of the balance and ask a child to bring the apparatus into equilibrium, using 1 g units. Have the children count the units used to make up 10 g.

4

Introduce the 100 g mass. Repeat the procedure in step 3, using ten 10 g units to achieve balance. If ten 10 g units are not available, make them from Plasticine.

5

Place ten 100 g units, or 100 g objects, on one arm of the balance. Ask a child to predict what single mass would bring the apparatus into balance. Place the 1 kg mass on the other arm to show the relationship.

6

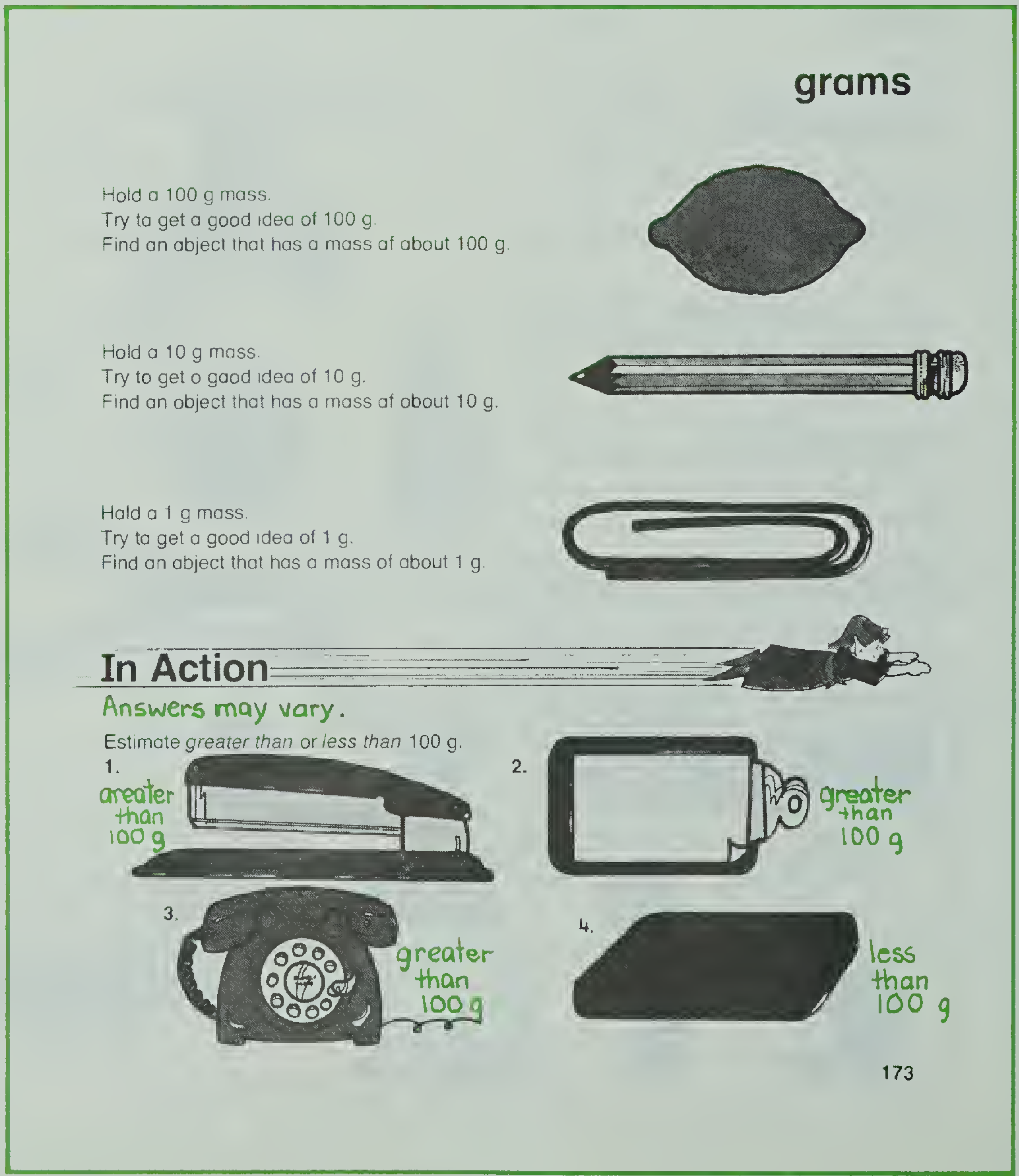
Name an object in the measurement centre or in the classroom. Ask a few children to estimate its mass in grams. Have a child measure the mass of the object named on the equal arm balance, using any of the standard units to achieve a balance. Discuss the estimate and the result of the measurement, explaining that estimates are not expected to be perfectly accurate. Repeat, naming a number of other objects, until each child has estimated and measured the mass of an object.

Written and Other Activities

☐

mathways 3, pages 173, 174

For the example exercise on page 173, have the children measure the objects named on an equal arm balance. Allow the children to use the equal arm balances and the standard units to complete exercises 13 to 20. If the objects shown are not available, substitute others.



grams

Hold a 100 g mass.
Try to get a good idea of 100 g.
Find an object that has a mass of about 100 g.

Hold a 10 g mass.
Try to get a good idea of 10 g.
Find an object that has a mass of about 10 g.

Hold a 1 g mass.
Try to get a good idea of 1 g.
Find an object that has a mass of about 1 g.

In Action

Answers may vary.

Estimate *greater than* or *less than* 100 g.

1. greater than 100 g

2. greater than 100 g

3. greater than 100 g

4. less than 100 g

173

☐ ☐

Have the children use Plasticine or plastic bags and sand or gravel to make units of mass ranging from 1 g to 500 g. Have the children label each mass.

☐ ☐ ☐

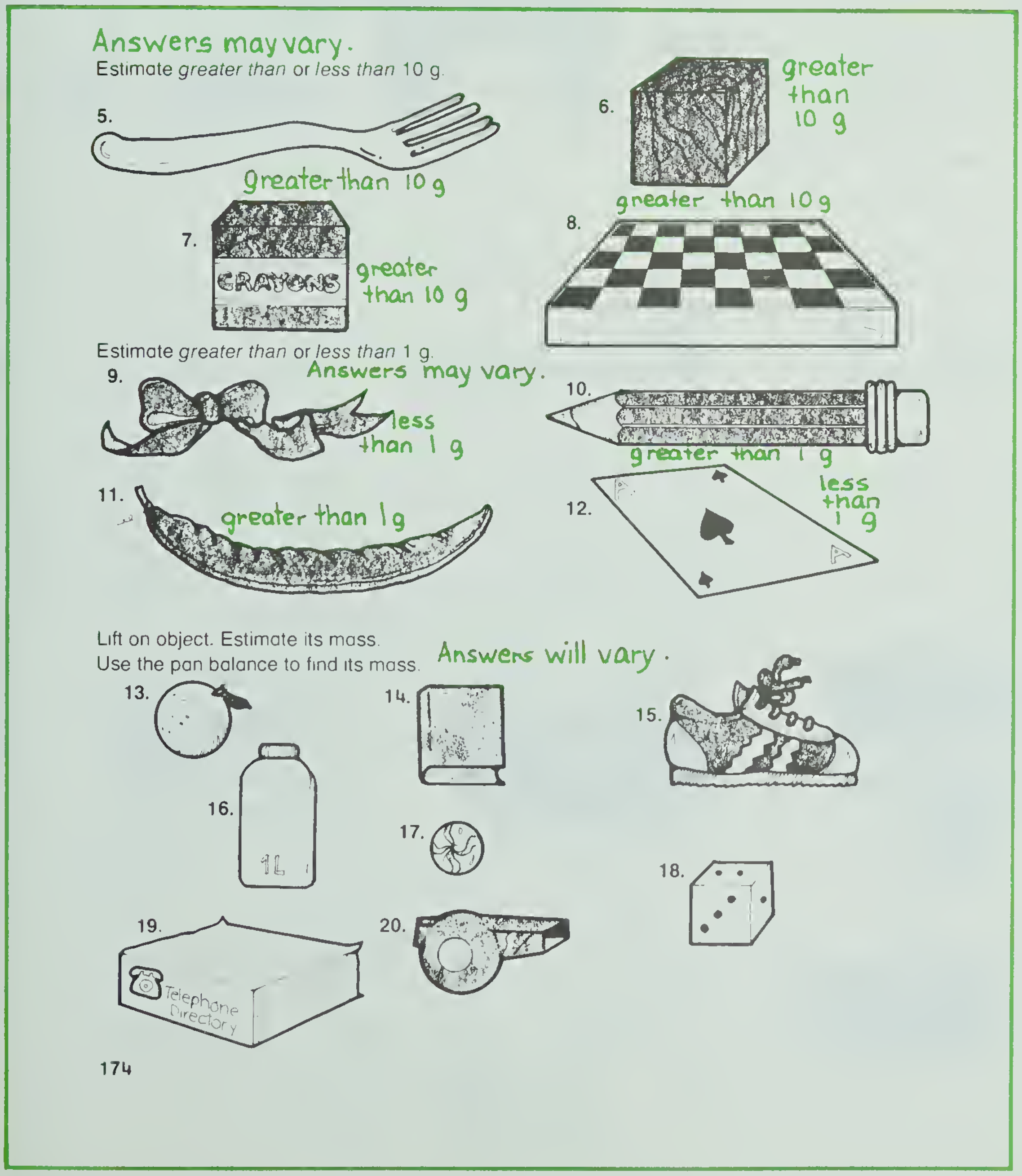
Have the children estimate the mass of 10 different objects to the nearest gram, and measure each, using the equal arm balance and the masses made for the previous activity. Remind the children that estimates are not expected to be exact. If the children are having difficulty, have them make estimates to the nearest 100 g.

☐ ☐ ☐ ☐

Have the children work in groups of three to list objects having masses close to 500 g, 100 g, 10 g and 1 g. Have each record the estimate, then measure and record the mass of each object. Have the children illustrate the objects listed. Display the illustrated lists.

☐ ☐ ☐ ☐ ☐

Have the children bring from home a variety of items on which the mass has been recorded. A typical collection might include a bag of sugar, a box of cereal, a bag of macaroni, a box of tea, a bag of coffee and a bag of beans. Loop each mass with a magic marker and discuss the size of each of the objects in relation to its mass, so that the children can begin to appreciate variations.



Answers may vary.

Estimate *greater than* or *less than* 10 g.

5. greater than 10 g

6. greater than 10 g

7. greater than 10 g

8. greater than 10 g

Estimate *greater than* or *less than* 1 g.

Answers may vary.

9. less than 1 g

10. greater than 1 g

11. greater than 1 g

12. less than 1 g

Lift on object. Estimate its mass.
Use the pan balance to find its mass.

Answers will vary.

13.

14.

15.

16.

17.

18.

19.

20.

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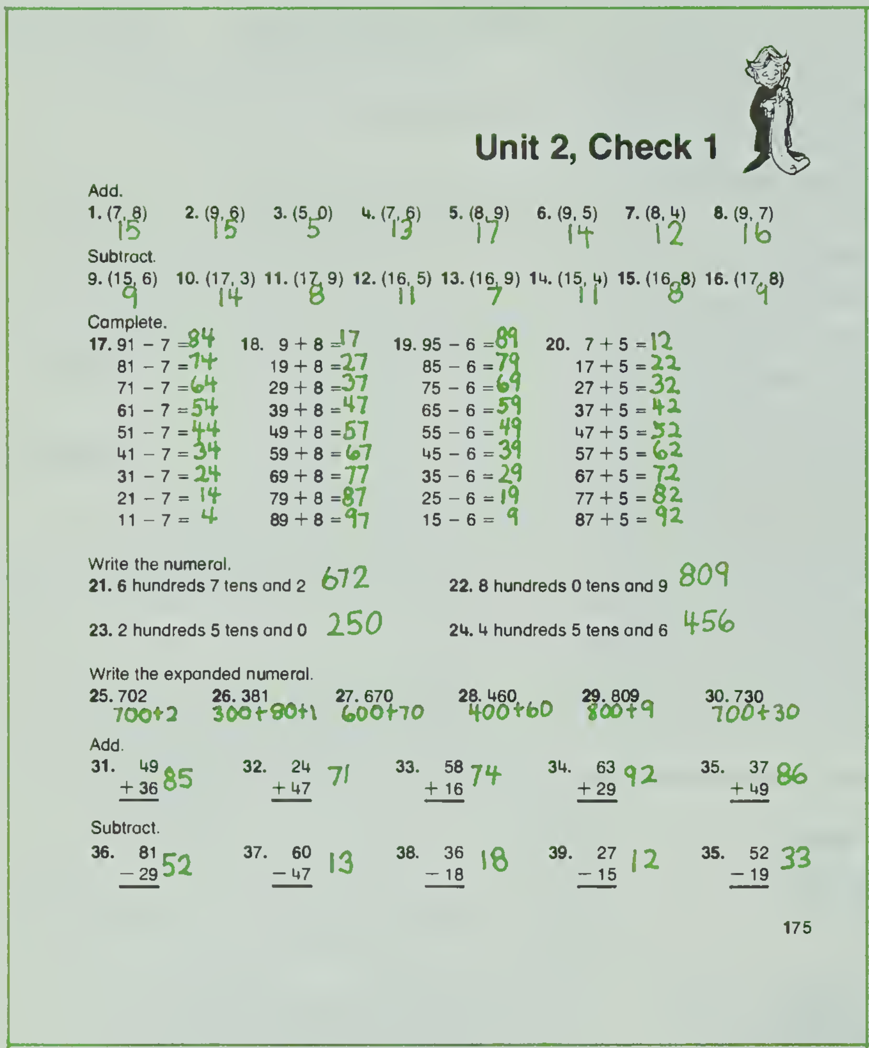
For Your Notes



Unit 2, Check 1

Add.

1. (7, 8) 15
2. (9, 6) 15
3. (5, 0) 5
4. (7, 6) 13
5. (8, 9) 17
6. (9, 5) 14
7. (8, 4) 12
8. (9, 7) 16

Subtract.

9. (15, 6) 9
10. (17, 3) 14
11. (17, 9) 8
12. (16, 5) 11
13. (16, 9) 7
14. (15, 4) 11
15. (16, 8) 8
16. (17, 8) 9

Complete.

17. 91 − 7 = 84	18. 9 + 8 = 17	19. 95 − 6 = 89	20. 7 + 5 = 12
81 − 7 = 74	19 + 8 = 27	85 − 6 = 79	17 + 5 = 22
71 − 7 = 64	29 + 8 = 37	75 − 6 = 69	27 + 5 = 32
61 − 7 = 54	39 + 8 = 47	65 − 6 = 59	37 + 5 = 42
51 − 7 = 44	49 + 8 = 57	55 − 6 = 49	47 + 5 = 52
41 − 7 = 34	59 + 8 = 67	45 − 6 = 39	57 + 5 = 62
31 − 7 = 24	69 + 8 = 77	35 − 6 = 29	67 + 5 = 72
21 − 7 = 14	79 + 8 = 87	25 − 6 = 19	77 + 5 = 82
11 − 7 = 4	89 + 8 = 97	15 − 6 = 9	87 + 5 = 92

Write the numeral.

21. 6 hundreds 7 tens and 2 672
22. 8 hundreds 0 tens and 9 809
23. 2 hundreds 5 tens and 0 250
24. 4 hundreds 5 tens and 6 456

Write the expanded numeral.

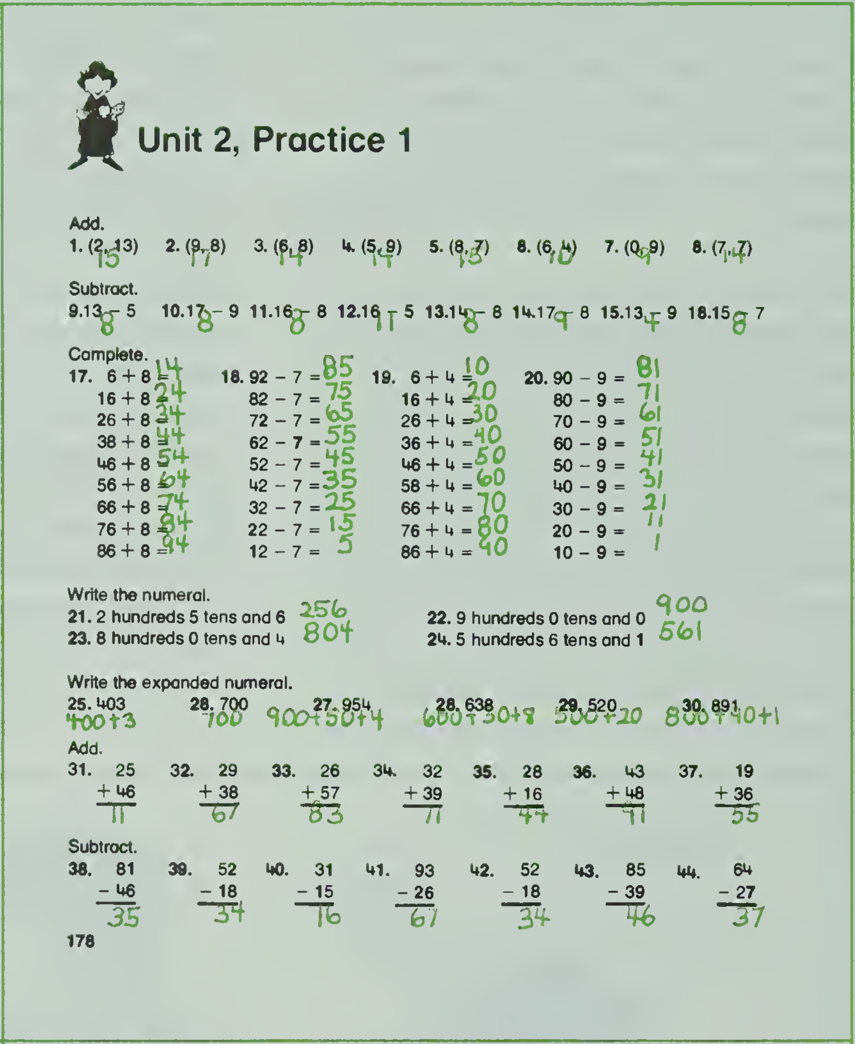
25. 702 700+2
26. 381 300+80+1
27. 670 600+70
28. 460 400+60
29. 809 800+9
30. 730 700+30

Add.

31. 49 + 36 85
32. 24 + 47 71
33. 58 + 16 74
34. 63 + 29 92
35. 37 + 49 86

Subtract.

36. 81 − 29 52
37. 60 − 47 13
38. 36 − 18 18
39. 27 − 15 12
35. 52 − 19 33



Unit 2, Practice 1

Add.

1. (2, 13) 15
2. (9, 8) 17
3. (6, 8) 14
4. (5, 9) 14
5. (8, 7) 15
8. (6, 4) 10
7. (0, 9) 9
8. (7, 7) 14

Subtract.

9. 13 − 5 8
10. 17 − 9 8
11. 16 − 8 8
12. 16 − 5 11
13. 14 − 8 8
14. 17 − 8 9
15. 13 − 9 4
18. 15 − 7 8

Complete.

17. 6 + 8 = 14	18. 92 − 7 = 85	19. 6 + 4 = 10	20. 90 − 9 = 81
16 + 8 = 24	82 − 7 = 75	16 + 4 = 20	80 − 9 = 71
26 + 8 = 34	72 − 7 = 65	26 + 4 = 30	70 − 9 = 61
38 + 8 = 44	62 − 7 = 55	36 + 4 = 40	60 − 9 = 51
46 + 8 = 54	52 − 7 = 45	46 + 4 = 50	50 − 9 = 41
56 + 8 = 64	42 − 7 = 35	58 + 4 = 60	40 − 9 = 31
66 + 8 = 74	32 − 7 = 25	66 + 4 = 70	30 − 9 = 21
76 + 8 = 84	22 − 7 = 15	76 + 4 = 80	20 − 9 = 11
86 + 8 = 94	12 − 7 = 5	86 + 4 = 90	10 − 9 = 1

Write the numeral.

21. 2 hundreds 5 tens and 6 256
22. 9 hundreds 0 tens and 0 900
23. 8 hundreds 0 tens and 4 804
24. 5 hundreds 6 tens and 1 561

Write the expanded numeral.

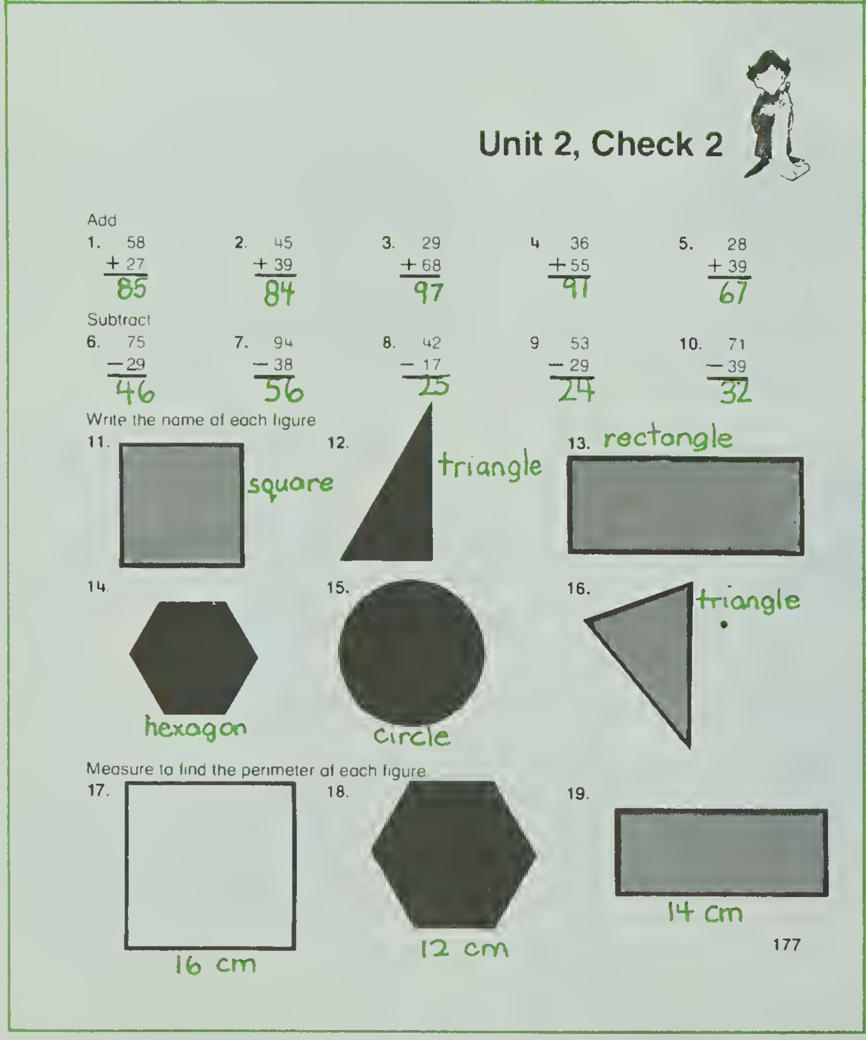
25. 403 400+3
28. 700 700
27. 954 900+50+4
28. 638 600+30+8
29. 520 500+20
30. 891 800+90+1

Add.

31. 25 + 46 71
32. 29 + 38 67
33. 26 + 57 83
34. 32 + 39 71
35. 28 + 16 44
36. 43 + 48 91
37. 19 + 36 55

Subtract.

38. 81 − 46 35
39. 52 − 18 34
40. 31 − 15 16
41. 93 − 26 67
42. 52 − 18 34
43. 85 − 39 46
44. 64 − 27 37



Unit 2, Check 2

Add

1. 58 + 27 85
2. 45 + 39 84
3. 29 + 68 97
4 36 + 55 91
5. 28 + 39 67

Subtract

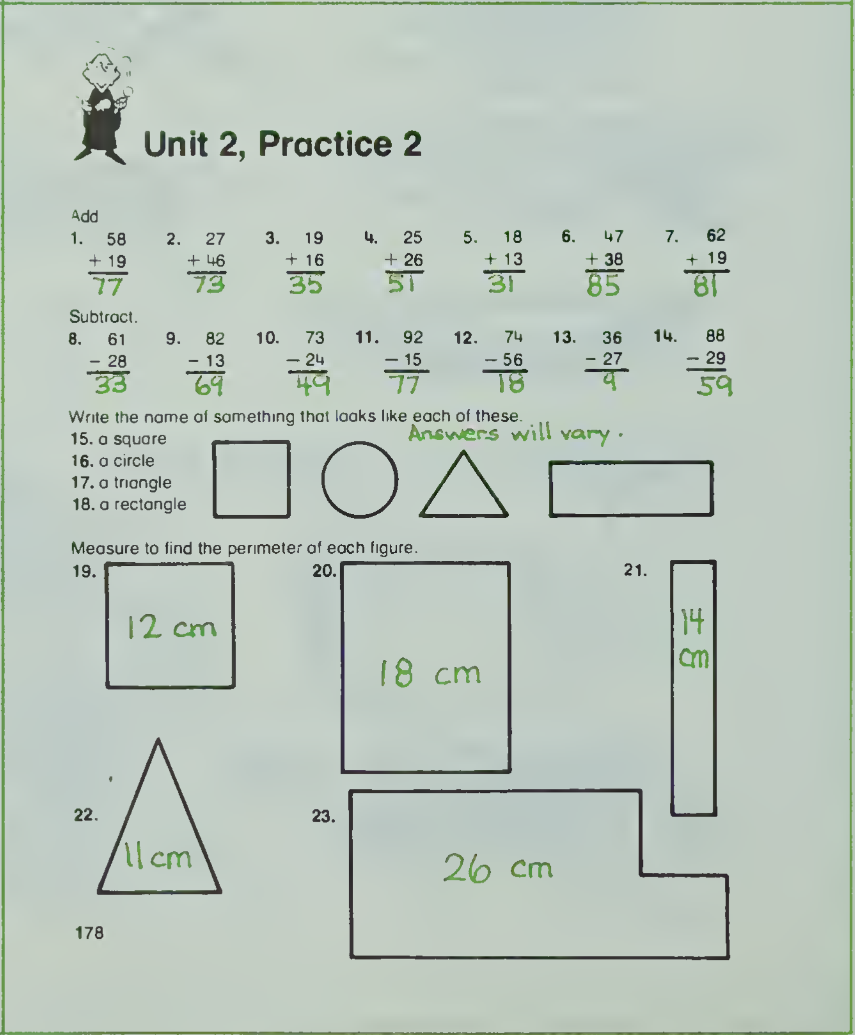
6. 75 − 29 46
7. 94 − 38 56
8. 42 − 17 25
9 53 − 29 24
10. 71 − 39 32

Write the name of each figure

11. square
12. triangle
13. rectangle
14. hexagon
15. circle
16. triangle

Measure to find the perimeter of each figure

17. 16 cm
18. 12 cm
19. 14 cm



Unit 2, Practice 2

Add

1. 58 + 19 77
2. 27 + 46 73
3. 19 + 16 35
4. 25 + 26 51
5. 18 + 13 31
6. 47 + 38 85
7. 62 + 19 81

Subtract.

8. 61 − 28 33
9. 82 − 13 69
10. 73 − 24 49
11. 92 − 15 77
12. 74 − 56 18
13. 36 − 27 9
14. 88 − 29 59

Write the name of something that looks like each of these.

15. a square
16. a circle
17. a triangle
18. a rectangle

Answers will vary.

Measure to find the perimeter of each figure.

19. 12 cm
20. 18 cm
21. 14 cm
22. 11cm
23. 26 cm

Unit 2, Check 3

Use the number line to help you complete each sentence.
Answers will vary. Here are some examples.

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4

1. 0.1 < 0.5 2. 0.4 > 0.2 3. 0.7 < 0.9 4. 0.6 < 0.7 5. 0.3 > 0.1
6. 0.2 > 0.1 7. 0.2 < 0.7 8. 0.9 > 0.3 9. 0.8 < 0.9 10. 0.5 < 0.6

Write sentences showing numbers greater than these. Answers will vary.
11. 0.5 12. 1.1 13. 0.1 14. 0.4 15. 1.4 16. 0.2 17. 1.3

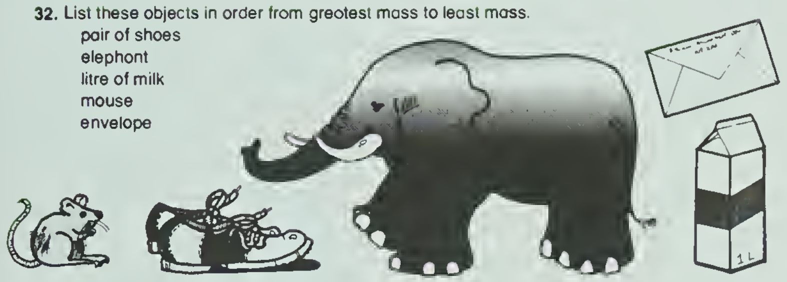
Add.

18.	19.	20.	21.	22.	23.	24.
0.6	0.2	0.4	0.5	0.6	0.4	0.8
+ 0.1	+ 0.7	+ 0.3	+ 0.2	+ 0.3	+ 0.5	+ 0.1
0.7	0.9	0.7	0.7	0.9	0.9	0.9

Subtract.

25.	26.	27.	28.	29.	30.	31.
0.9	0.6	0.7	0.5	0.8	0.7	0.7
− 0.1	− 0.2	− 0.5	− 0.4	− 0.2	− 0.7	− 0.4
0.8	0.4	0.2	0.1	0.6	0.0	0.3

32. List these objects in order from greatest mass to least mass.
pair of shoes
elephant
litre of milk
mouse
envelope



Answers may vary.
Elephant, shoes, milk, mouse, envelope

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Unit 2, Practice 3

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4

Complete. Answers will vary. Here are some examples.
1. 0.4 0.6 2. 0.7 0.3 3. 0.9 1.2 4. 0.8 1.0 5. 0.1 0
6. 0.8 0.2 7. 0.2 0.1 8. 0.6 1.4 9. 0.4 0.3 10. 0.9 0.5

Write sentences showing numbers less than these Answers will vary.
11. 1.2 12. 0.9 13. 0.4 14. 0.6 15. 0.8 16. 1.3 17. 0.2

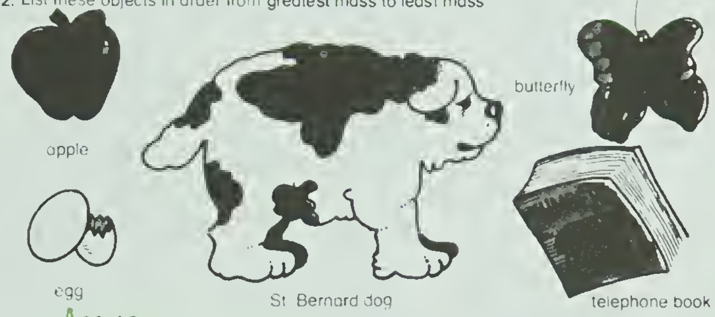
Add

18.	19.	20.	21.	22.	23.	24.
0.5	0.8	0.1	0.2	0.6	0.5	0.7
+ 0.2	+ 0.1	+ 0.3	+ 0.4	+ 0.1	+ 0.3	+ 0.1
0.7	0.9	0.4	0.6	0.7	0.8	0.8

Subtract

25.	26.	27.	28.	29.	30.	31.
0.9	0.6	0.7	0.5	0.8	0.7	0.9
0.1	0.3	0.2	0.1	0.1	0.6	0.9
0.8	0.3	0.5	0.4	0.7	0.1	0.0

32. List these objects in order from greatest mass to least mass



180

Answers may vary.
Dog, telephone book, apple, egg, butterfly

Unit 2, Check 4

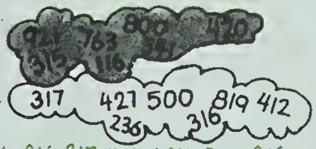
Write the numeral 2 less than
1. 3 hundreds 4 tens and 2 340
2. 5 hundreds 1 ten and 1 509
3. 8 hundreds 0 tens and 2 800
4. 2 hundreds 6 tens and 2 260
5. 5 hundreds 8 tens and 0 578
6. 7 hundreds 0 tens and 0 698

Write the numeral 2 greater than
7. 1 hundred 0 tens and 8 110
8. 7 hundreds 5 tens and 2 754
9. 6 hundreds 9 tens and 8 700
10. 8 hundreds 4 tens and 5 847
11. 3 hundreds 0 tens and 0 302
12. 6 hundreds 1 ten and 0 612

Continue the patterns
13. 202. 205. 208 211, 214, 217. 220. 223, 226
14. 600. 605. 610. 615, 620, 625, 630, 635, 640
15. 404 408. 412. 416, 420, 424. 428. 432, 436
16. 700. 697. 694 691, 688, 685, 682, 679, 676
17. 544 540. 536 532. 528, 524, 520, 516, 512
18. 555. 550. 545. 540, 530, 525, 520, 515, 510
19. 315. 320. 325. 330, 335, 340, 345, 350, 355
20. 220. 218 216. 214. 212. 210, 208, 206, 204

Write the numerals in order from least to greatest
116. 315, 420, 541, 763, 800, 921,
125. 263, 372, 487 488, 613, 912

21.
23.



22.
24.

236, 316, 317, 412, 427, 500, 819
175, 325, 416, 520, 683, 932,

Expand and add

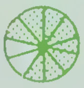
25.	26.	27.	28.	29.	30.
35	44	64	39	73	56
+ 29	+ 37	+ 28	+ 15	+ 17	+ 19
64	81	92	54	90	75

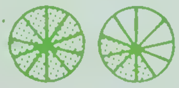
Make the exchange
Complete the subtraction

31.	32.	33.	34.	35.	36.
60	86	82	50	35	53
39	19	28	21	16	27
21	67	54	29	19	26

37. Draw a picture to show 0.8.
38. Draw a picture to show 1.4.

Pictures will vary.
Here are some examples.

37.


38.


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Unit 2, Practice 4

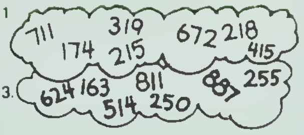
Write the numeral 2 less than
1. 3 hundreds 8 tens and 8 386
2. 6 hundreds 4 tens and 4 642
3. 7 hundreds 2 tens and 6 724
4. 4 hundreds 0 tens and 0 398
5. 5 hundreds 5 tens and 4 552
6. 8 hundreds 4 tens and 3 841

Write the numeral 2 greater than
7. 9 hundreds 1 ten and 3 915
8. 5 hundreds 9 tens and 2 594
9. 1 hundred 7 tens and 1 173
10. 2 hundreds 0 tens and 9 211
11. 4 hundreds 3 tens and 5 437
12. 3 hundreds 6 tens and 7 369

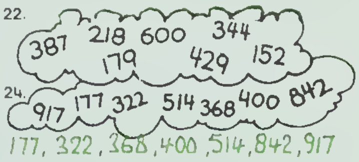
Continue the patterns
13. 602. 600. 598. 596, 594, 592, 590, 588, 586
14. 185. 190. 195. 200. 205, 210, 215, 220, 225
15. 303. 306. 309. 312, 315, 318, 321, 324, 327
16. 817. 819. 821. 823, 825, 827, 829, 831, 833
17. 420. 424. 428. 432, 436, 440, 444, 448, 452
18. 415. 410. 405. 400. 395, 390, 385, 380, 375
19. 717. 714 711. 708, 705, 702, 699, 696, 693
20. 704. 708. 712. 716, 720, 724, 728, 732, 736

Write the numerals in order from least to greatest
174, 215, 218, 319, 415, 672, 711
152, 179, 218, 344, 387, 429, 600

21
23.



22.
24.



163, 250, 255, 514, 624, 811, 887
177, 322, 368, 400, 514, 842, 917

Expand and add

25.	26.	27.	28.	29.	30.
29	57	79	38	68	46
+ 37	+ 29	+ 15	+ 26	+ 22	+ 46
66	86	94	64	90	92

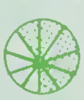
Make the exchange
Complete the subtraction

31.	32.	33.	34.	35.	36.
32	73	62	84	43	51
19	27	35	48	− 29	− 37
13	46	27	36	14	14

37. Draw a picture to show 0.6.
38. Draw a picture to show 2.3.

Pictures will vary.
Here are some examples.

182

37.


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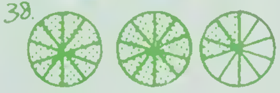

For Your Notes

For Your Notes

For Your Notes

Contents

See the *Unit at a Glance* for a detailed description of the objectives in each section.

Section	*mathways 3* Pages	Teaching Notes Pages
1	184–189	201–206
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Unit 3 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 1						
1	**184, 185**	**201, 202**	Multiplying: sets of six to 6 × 7	Plus Workbook page 54	• counters • paper plates • die marked 6, 12, 18, 24, 30, 42 • dice: one marked 6, 6, 7, 7, 7,; one marked 0, 1, 3, 4, 5, 6 • die marked 14, 21, 28, 35, 42, 49 • Program Masters 2, 24	factor multiplication chart
2	**186**	**203**	Dividing by six to 42 ÷ 6	Plus Workbook page 55		
3	**187, 188**	**204, 205**	Multiplying: sets of seven to 7 × 7	Practice Masters page 36 Plus Workbook page 56		
4	**189**	**206**	Dividing by seven to 49 ÷ 7	Practice Masters page 37 Plus Workbook page 57		
Section 2						
1	**190, 191**	**207, 208**	Telling time: one-minute intervals, earlier and later		• demonstration clock, real or cardboard • large clock with second hand • model clocks made for *mathways 3* page 35 • counters • string • cards with numerals 0 to 9 • multiplication expression cards, TN page 214 • stencils, TN pages 211, 217 • Program Masters 25, 21, 2	second hand equivalent double/doubling array
2	**192**	**209**	Solving problems about time	Practice Masters pages 38 and 39		
3	**193**	**210, 211**	Writing equivalent multiplication sentences			
4	**194, 195**	**212–214**	Equivalent multiplication sentences using rows and columns to represent multiplication sentences			
5	**196**	**215**	Exploring multiplication facts to 7 × 7	Practice Masters page 40 Plus Workbook page 60		
6	**197**	**216, 217**	Using rows and columns to represent division sentences	Practice Masters page 41 Tests 1A, 1B Plus Workbook page 61		
7	**198**	**218**	Drawing pictures for multiplication to 7 × 7	Plus Workbook page 62		
8	**199**	**219**	Drawing pictures for division to 49 ÷ 7	Plus Workbook page 63		

Unit 3 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 3					• counters • die marked 4, 5, 6, 7, 8, 9 • display-size multiplication chart, TN page 223 • die marked 4, 5, 6, 7, 8, 9 • multiplication-expression cards • tape recorder and earphones (optional) • die marked 0, 8, 16, 32, 32, 40 • die marked 32, 40, 48, 56, 64, 72 • die marked 0, 9, 18, 27, 36, 36 • die marked 45, 54, 63, 72, 81, 81 • dice marked 4 to 9 • two dice marked 1 to 6 • stencils, TN page 221 • Program Masters 2, 6	
1	**200**	**220, 221**	Multiplying by eight to 8 × 9			
2	**201**	**222, 223**	Multiplying by nine to 9 × 9	Practice Masters page 42 Plus Workbook page 64		
3	**202**	**224**	Dividing by eight			
4	**203**	**225**	Dividing by nine	Practice Masters page 43 Plus Workbook page 65		
5	**204**	**226, 227**	Reviewing multiplication and division facts: making arrays, mental arithmetic	Practice Masters pages 44 and 45		
6	**205**	**228**	Reading charts, solving word problems	Plus Workbook pages 66 and 67		
Section 4						
1	**206, 207**	**229, 230**	Exploring area: counting squares, creating designs		• four 10 cm squares • sixteen 5 cm squares • construction paper in several different colours • masking tape • 20 cm rulers • display-size squared paper showing various regions in different colours • demonstration thermometer, Overview 7 • several Celsius thermometers • glasses • ice cubes • several newspapers reporting temperatures above 0°C • display-size graph, TN page 234 • Program Master 5	region square units area square centimetre dimensions width length degrees Celsius temperature thermometer
2	**208**	**231**	Exploring area: counting square centimetres, writing the symbol cm^2	Plus Workbook page 68		
3	**209**	**232**	Recalling multiplication and division facts, recalling area	Practice Masters page 46		
4	**210**	**233**	Exploring temperature: reading and comparing temperatures above 0°C			
5	**211**	**234**	Exploring temperature: graphing temperature	Practice Masters page 48 Plus Workbook page 69		

Unit 3 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 5						
1	**212**	**235**	Recalling place value and expanded numerals for three-digit numbers		• place-value mats • place-value materials: 100-flats, 10-strips, unit strips • abaci • dice marked 0 to 5 • dice marked 4 to 9 • dice marked 1, 3, 5, 7, 8, 9 • pegs • sets of numeral cards marked 0 to 9 • boxes • gameboard • markers • blue die marked 1, 1, 2, 2, 3, 3 • red die marked 4 to 9 • metre stick • stencil, TN pages 237, 241 • Program Masters 27, 28	standard numeral abacus
2	**213, 214**	**236–238**	Representing three-digit numbers on an abacus	Practice Masters page 47 Plus Workbook page 70		
3	**215**	**239, 240**	Adding 2 two-digit numbers: exchanging 10 ones for a ten			
4	**216**	**241**	Using expanded numerals to make an exchange	Plus Workbook pages 71 and 72		
5	**217**	**242, 243**	Showing subtraction that requires regrouping on the abacus			
6	**218**	**244**	Using expanded numerals for subtraction requiring an exchange	Practice Masters page 48 Tests 2A, 2B Plus Workbook pages 73 and 74		
7	**219**	**245**	Solving word problems: reading and making maps	Plus Workbook page 75		
Section 6						
1	**220**	**246, 247**	Using standard and expanded numerals to add three-digit numbers	Plus Workbook page 76	• place-value mats • place-value materials: 100-flats, 10-strips, unit strips • abaci • place-value charts • red cube marked 1, 2, 3, 3, 4, 4 • blue cube marked 5, 5, 6, 7, 8, 9 • green cube marked 1, 2, 3, 3, 4, 4 • yellow dice marked 1, 1, 2, 3, 4, 4 • blue dice marked 0, 1, 6, 7, 8, 9 • red dice marked 2, 3, 4, 5, 8, 9 • stencil, TN page 255 • Program Masters 19, 20, 28, 22	
2	**221**	**248, 249**	Exchanging 10 ones for 1 ten			
3	**222**	**250, 251**	Adding three-digit numbers: exchanging 10 tens for 1 hundred	Practice Masters page 49		
4	**223**	**252, 253**	Adding three-digit numbers: making two exchanges			
5	**224**	**254, 255**	Adding three-digit numbers: thinking the exchange	Practice Masters page 50 Plus Workbook page 78		

Unit 3 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 7						
1	**225**	**256, 257**	Subtracting three-digit numbers: exchanging 1 ten for 10 ones		• place-value mats • place-value materials: 100-flats, 10-strips, unit strips • abaci • tracing paper • construction paper • variety of materials for making a model of a neighbourhood, TN page 265 • catalogues, magazines, newspapers • 10 cm by 10 cm pieces of construction paper • stencils, TN pages 257, 262	direction north south east west location
2	**226**	**258, 259**	Subtracting three-digit numbers: exchanging 1 hundred for 10 tens	Practice Masters page 51 Plus Workbook page 79		
3	**227**	**260**	Subtracting three-digit numbers: two exchanges	Practice Masters page 52		
4	**228**	**261**	Thinking the exchanges for adding and subtracting	Plus Workbook page 80		
5	**229**	**262**	Byway: finding the missing numbers			
6	**230**	**263**	Recalling addition and subtraction of two- and three-digit numbers	Practice Masters page 53 Plus Workbook page 81		
7	**231**	**264, 265**	Making and using maps, making up and solving problems	Plus Workbook page 82		
8	**232, 233**	**266, 267**	Drawing pictures to help solve problems	Practice Masters page 54 Tests 3A, 3B Plus Workbook pages 83 and 84		
Section 8						
1	**234, 235**	**268, 269**	Recalling multiplication facts	Practice Masters pages 62 and 63 Plus Workbook pages 95 and 96	• wall multiplication chart • blank cards • counters • stencil, TN page 275 • Program Masters 21, 24	
2	**236**	**270**	Recalling multiplication and division facts: products and dividends on a diagonal			
3	**237**	**271**	Recalling multiplication and division facts			
4	**238**	**272**	Recalling multiplication and division facts: diagonals, numbers pairs			
5	**239**	**273**	Recalling multiplication and division facts: diagonals			

Unit 3 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
6	**240**	**274**	Recalling multiplication and division facts	Plus Workbook page 85		
7	**241**	**275**	Solving multiplication problems	Practice Masters pages 55 and 56 Plus Workbook page 86		
Section 9						
1	**242**	**276**	Byway: recalling three-dimensional solids		• three-dimensional solids: cube, prism, cone, cylinder, sphere • chart paper • containers have capacities of 1 L, 100 mL, 10 mL • containers having various, undetermined capacities • set of measuring spoons marked in millilitres • water, sand, rice or similar pourable substance • activity cards, TN page 278	millilitre
2	**243, 244**	**277, 278**	Estimating and measuring capacity: the millilitre			
3	**245**	**279**	Estimating and measuring capacity: 100 mL			
Section 10						
1	**246, 247**	**280, 281**	Exploring the tangram		• demonstration-size tangram • tracing paper • light cardboard • envelopes • numbered tangram pieces • book of tangram puzzles • tangram puzzle pieces • blank cards • Program Masters 29	tangram
2	**248**	**282**	Exploring tangrams: making rectangles			
3	**249**	**283**	Exploring tangrams: making squares and triangles			
4	**250**	**284**	Byway: solving tangram puzzles			
Section 11						
1	**251**	**285**	Exploring volume: building with cubes		• 2 cm interlocking cubes • 1 cm interlocking cubes • tape • marking pens • small boxes brought from home • several metre sticks • trundle wheel • road maps • Program Masters 6, 5	cubic centimetre volume trundle wheel odometer
2	**252, 253**	**286, 287**	Exploring volume: counting cubic centimetres			
3	**254**	**288, 289**	Exploring volume			
4	**255, 256**	**290, 291**	Exploring the kilometre			

Unit 3 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 12						
1	**257**	**292, 293**	Adding decimals: sums greater than one	Plus Workbook page 87	• display-size number line • die marked 13 tenths, 14 tenths, 18 tenths, 20 tenths, 21 tenths, 22 tenths • four dice showing different numbers of tenths • gameboards, TN pages 297, 301 • die marked 0.1 to 0.6 • red markers • blue markers • die marked 1.1 to 9.9 • stencils, TN pages 297, 300 • Program Masters 30, 33	whole
2	**258, 259**	**294, 295**	Exchanging 10 tenths for one			
3	**260**	**296, 297**	Adding decimals: exchanging 10 tenths for one whole	Practice Masters page 57 Plus Workbook page 88		
4	**261**	**298**	Subtracting decimals			
5	**262**	**299**	Exchanging 10 tenths for one			
6	**263**	**300, 301**	Subtracting decimals: exchanging one whole for 10 tenths	Practice Masters page 58 Plus Workbook page 89		
7	**264**	**302**	Adding and subtracting decimals: thinking the exchange	Practice Masters page 59 Plus Workbook page 90		
Section 13						
1	**265**	**303**	Solving word problems		• large map of Canada • several maps of other cities, showing bus or subway routes • chart paper • gameboard, TN page 305 • red, yellow, blue and green markers • catalogues and newspapers • pictures of vehicles with various numbers of wheels, such as bicycles, trucks, cars, tricycles	
2	**266, 267**	**304, 305**	Solving word problems			
3	**268**	**306**	Drawing pictures to help solve word problems			
4	**269**	**307**	Solving word problems with multiplication and division			
5	**270, 271**	**308, 309**	Solving word problems: maps, distances in kilometres, amounts of money	Tests 4A, 4B Plus Workbook pages 91 and 92		
	272–279	**310–312**	Checks and Practices	Unit 3, Unit Tests A, B		

Unit 3 Section 1 Lesson 1

Multiplying: Sets of Six to 6 × 7

Materials

- for each child
  - 42 counters
  - seven paper plates

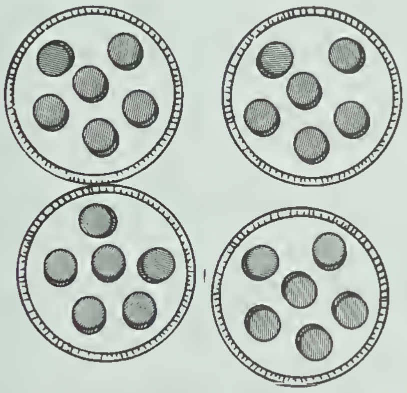
Rationale

The *mathways* approach to teaching multiplication is to provide children with many opportunities to explore equal sets, discover multiplication facts several times and use the facts that have been discovered at frequent intervals. This procedure ensures the development of the concept of multiplication and the memorization of facts. Frequent short drills thereafter are necessary to help the children retain the multiplication facts they have learned.

Lesson

1

Seat the children around the working area and distribute the paper plates and counters. Discuss multiplication, reminding the children that a multiplication fact represents equal sets. Have a child show four sets of six counters.



Ask children to tell the number of sets, the number of counters in each set and the total number of counters. Write on the easel

4 sets of 6 are 24

4 times 6 equals 24

4 × 6 = 24

Have the children use their counters and paper plates to show other sets of six and write the multiplication sentences on the easel. Include 0 × 6 to 7 × 6.

2

Write on the easel

5 ×6 =

Have a child read the expression and have all the group members show five sets of six with counters on paper plates. Ask the children how many counters there are altogether and have a child complete the multiplication sentence.

5 × 6 = 30

Invite children to write multiplication sentences on the easel for the other children to demonstrate and complete.

3

Write the following multiplication questions on the easel:

$$\begin{array}{ccccccc} 7 & 4 & 0 & 3 & 5 & 1 & 2 \\ \underline{\times 6} & \underline{\times 6} & \underline{\times 6} & \underline{\times 6} & \underline{\times 6} & \underline{\times 6} & \underline{\times 6} \end{array}$$

Have the children complete them.

4

Have the children draw pictures to illustrate each of the multiplication facts from 0 × 6 to 7 × 6 and write the appropriate fact under each picture. Display the pictures in the classroom.

5

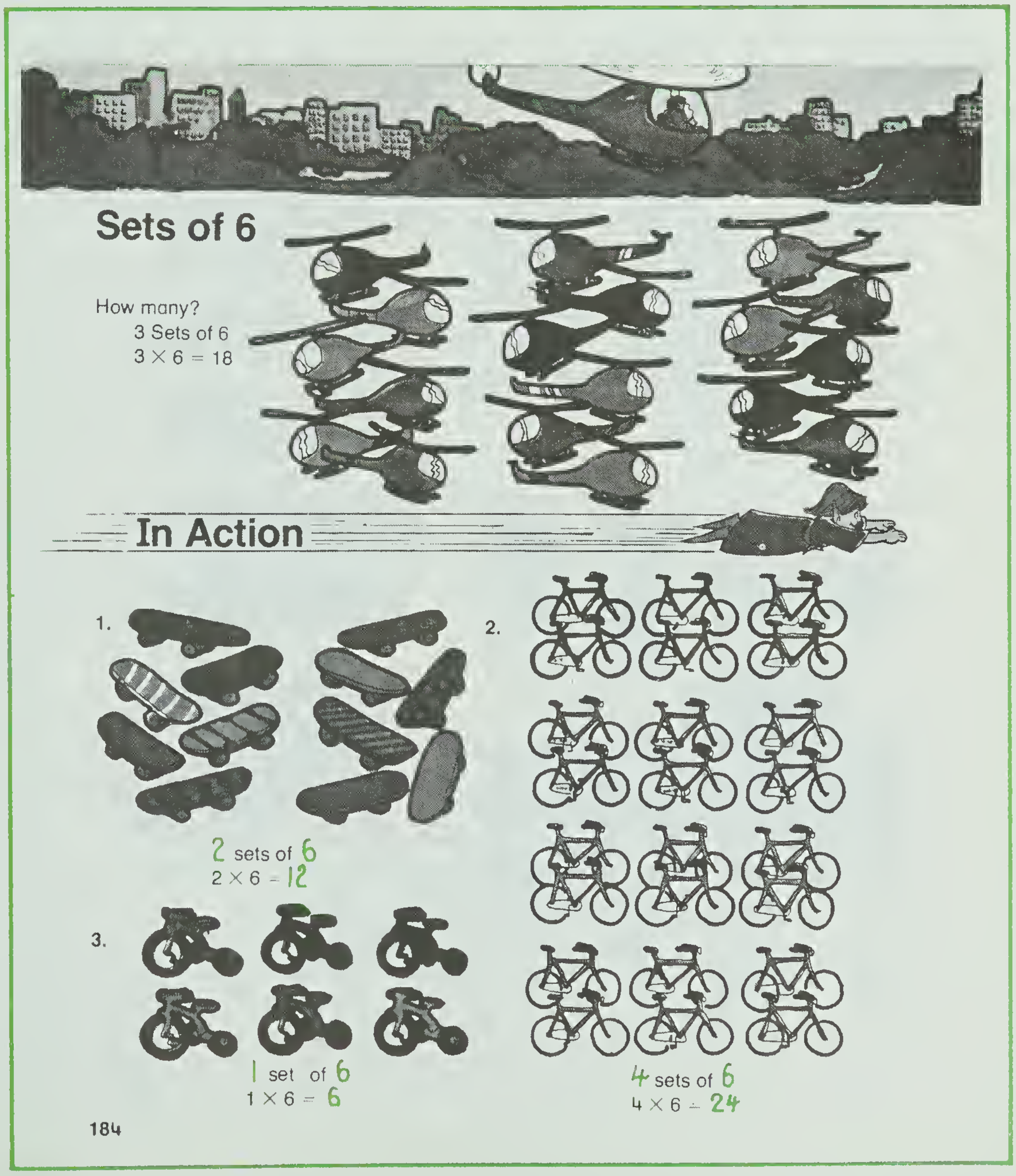
Write on the easel

____ × 6 = 36

4 × ____ = 24

6 × 7 = ____

Have the children discover and fill in the missing factor for each sentence.



Sets of 6

How many?
3 Sets of 6
3 × 6 = 18

In Action

1.

2 sets of 6
2 × 6 = 12

2.

4 sets of 6
4 × 6 = 24

3.

1 set of 6
1 × 6 = 6

184

Written and Other Activities

☐

mathways 3, pages 184, 185

Have a child read the example at the top of the page. Discuss the idea of equal sets of six. Provide counters for children who need them to complete the In Action questions.

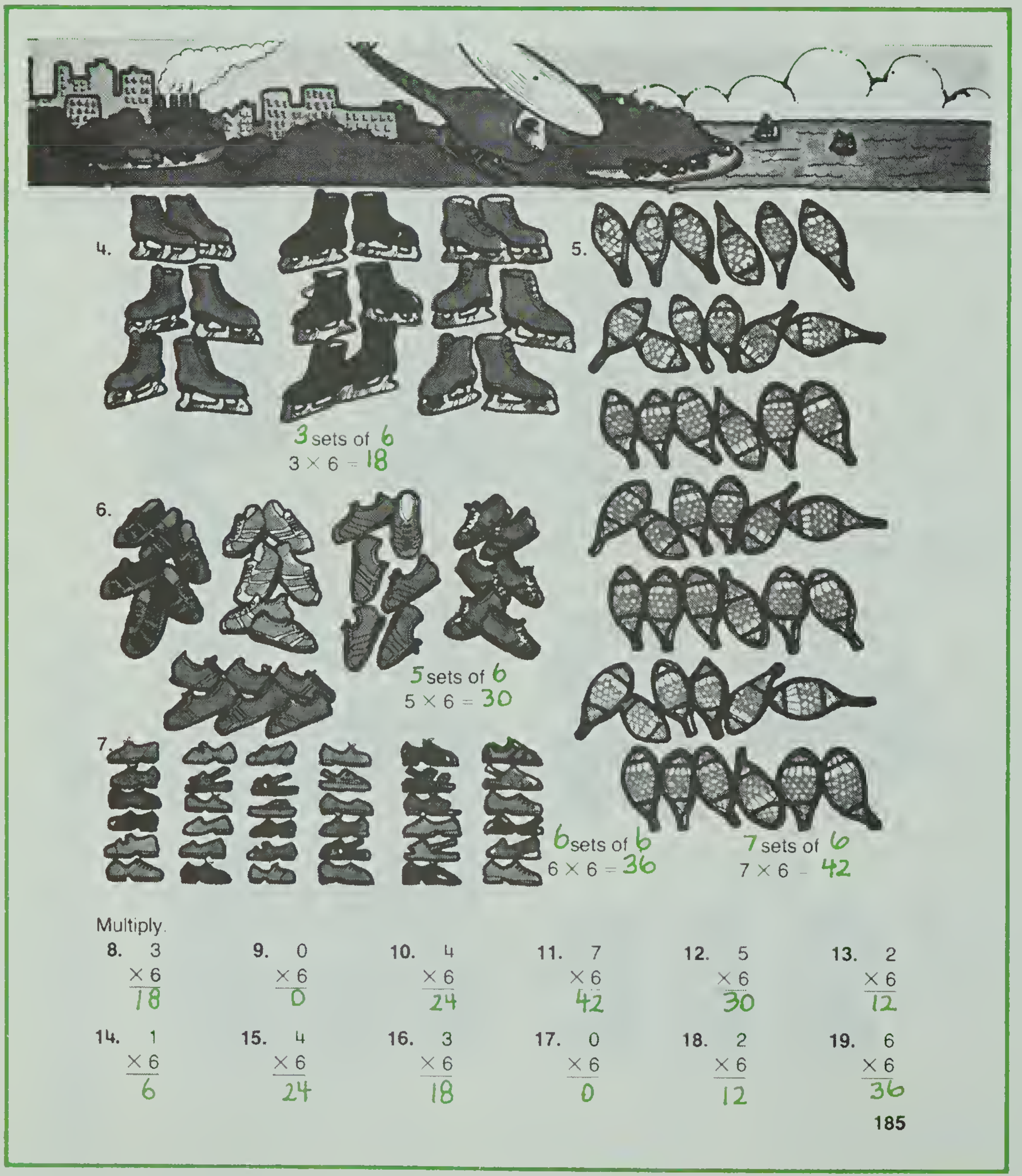
☐ ☐

To prepare children for division, which appears on the following *mathways* pages, have them find and fill in the missing factor for each of the following multiplication sentences:

1. 4 × ☐ = 24
2. ☐ × 6 = 30
3. 2 × ☐ = 10
4. 7 × ☐ = 35
5. ☐ × 3 = 18
6. 4 × ☐ = 0
7. 1 × ☐ = 5
8. 3 × ☐ = 9
9. ☐ × 2 = 12
10. ☐ × 6 = 42
11. 5 × ☐ = 25
12. ☐ × 2 = 8
13. ☐ × 3 = 3
14. 5 × ☐ = 20
15. ☐ × 1 = 0
16. 3 × ☐ = 15
17. 6 × ☐ = 36
18. ☐ × 4 = 0
19. 1 × ☐ = 6
20. ☐ × 4 = 16

☐ ☐ ☐

mathways 3 Plus Workbook page 54



4. 3 sets of 6
3 × 6 = 18

5. 7 sets of 6
7 × 6 = 42

6. 5 sets of 6
5 × 6 = 30

7. 6 sets of 6
6 × 6 = 36

Multiply.

8. $\begin{array}{r}3\\ \times 6\\ \hline 18\end{array}$ 9. $\begin{array}{r}0\\ \times 6\\ \hline 0\end{array}$ 10. $\begin{array}{r}4\\ \times 6\\ \hline 24\end{array}$ 11. $\begin{array}{r}7\\ \times 6\\ \hline 42\end{array}$ 12. $\begin{array}{r}5\\ \times 6\\ \hline 30\end{array}$ 13. $\begin{array}{r}2\\ \times 6\\ \hline 12\end{array}$

14. $\begin{array}{r}1\\ \times 6\\ \hline 6\end{array}$ 15. $\begin{array}{r}4\\ \times 6\\ \hline 24\end{array}$ 16. $\begin{array}{r}3\\ \times 6\\ \hline 18\end{array}$ 17. $\begin{array}{r}0\\ \times 6\\ \hline 0\end{array}$ 18. $\begin{array}{r}2\\ \times 6\\ \hline 12\end{array}$ 19. $\begin{array}{r}6\\ \times 6\\ \hline 36\end{array}$

185

For Your Notes

Unit 3 Section 1 Lesson 2

Dividing by Six to 42 ÷ 6

Materials

- for each child
  - – 42 counters
  - – seven paper plates
- for groups of four
  - – die marked 6, 12, 18, 24, 30, 42

Rationale

As in previous sections, the children explore division by manipulating concrete materials, thus developing the concept of dividing into equal sets and discovering division facts many times. Then the facts are used frequently in a variety of situations so that the children retain them.

Lesson

1

Gather the children around the working area. Distribute the paper plates and counters. Review the meaning of division by having the children separate their counters into equal sets to discover the number of sets. Then have a child show 18 counters and make sets of six by placing them on paper plates until all the counters are gone.

Ask a child to tell the number of counters altogether, the number in each set and the number of sets. Write on the easel

18 counters divided into sets of 6
make 3 sets
18 divided by 6 equals 3
18 ÷ 6 = 3

Repeat the activity, developing other division facts to 42 ÷ 6.

2

Write on the easel *30 ÷ 6 =*

Have a child arrange 30 counters in sets of six to discover the number of sets and complete the number sentence. *30 ÷ 6 = 5*

Repeat for other division facts, from 6 ÷ 6 to 42 ÷ 6.

3

Have the children draw pictures to illustrate each division fact of six to 42 ÷ 6 and write the fact under each picture. Display these beside the pictures illustrating multiplication facts, completed earlier. Discuss the relationship between each set of pictures. For example the picture illustrating 4 × 6 = 24 and the picture illustrating 24 ÷ 6 = 4 both show four sets of six objects.

Written and Other Activities

☐

mathways 3, page 186

Discuss the example. Allow children who need them to use counters to complete the In Action questions.

☐ ☐

Have the children write the corresponding multiplication fact for each division question on page 186, for example 30 ÷ 6 = 5, 5 × 6 = 30. Have children give a story for questions 4 to 15, using the flight theme. For question 4 a child might say

Thirty people flew in planes.
There were six people on each plane.
There were five planes altogether.

☐ ☐ ☐

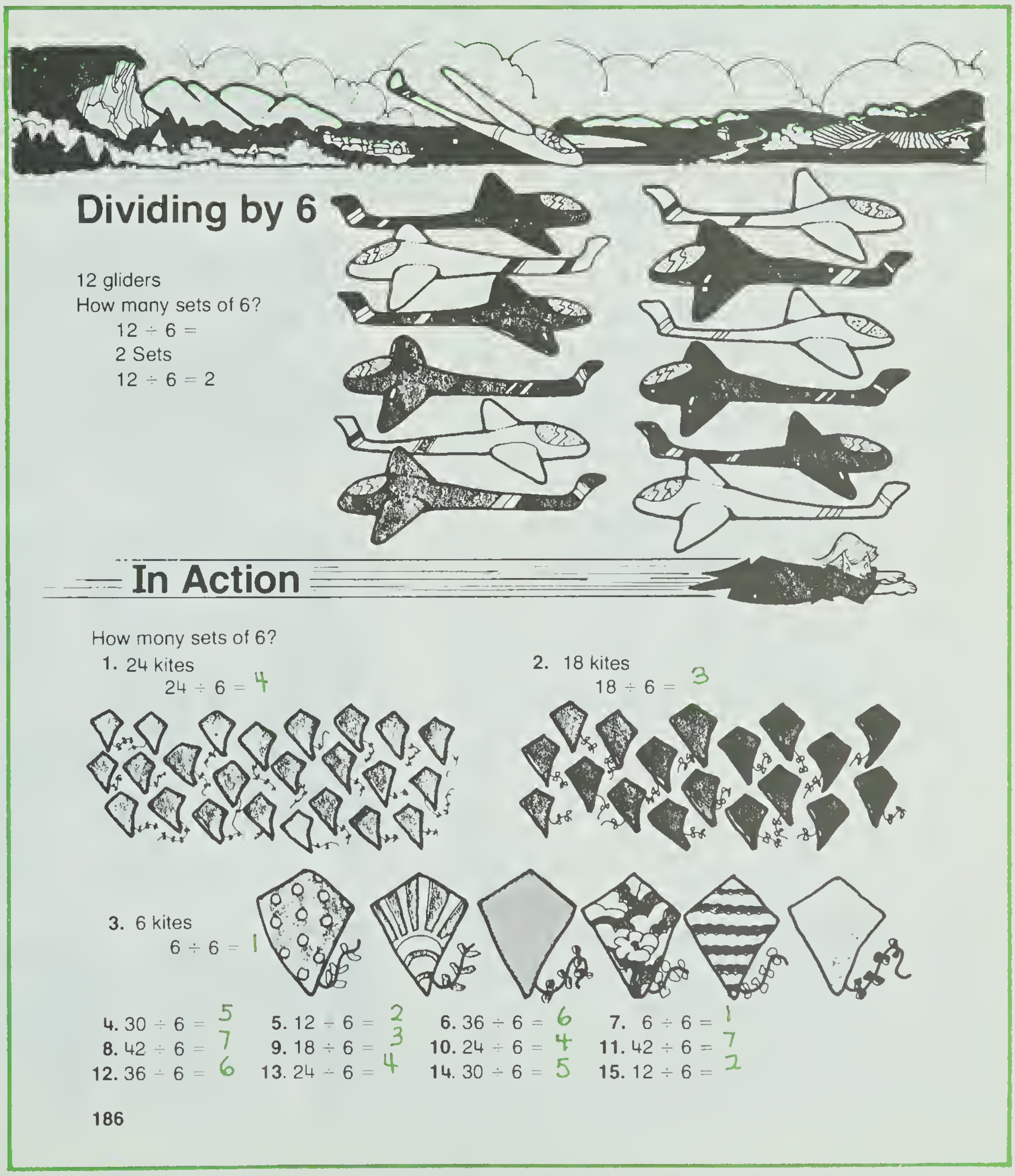
Mark a die 6, 12, 18, 24, 30 and 42 for each group of four players. The players take turns tossing the die and then stating a division sentence with the number on the upturned face of the die divided by six.

Eighteen divided by six equals three.

Players score a point for each correct statement. The player with the highest score after 10 rounds is the winner.

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 55



Dividing by 6

12 gliders
How many sets of 6?
12 ÷ 6 =
2 Sets
12 ÷ 6 = 2

In Action

How many sets of 6?

1. 24 kites
24 ÷ 6 = 4

2. 18 kites
18 ÷ 6 = 3

3. 6 kites
6 ÷ 6 = 1

4. 30 ÷ 6 = 5
5. 12 ÷ 6 = 2
6. 36 ÷ 6 = 6
7. 6 ÷ 6 = 1
8. 42 ÷ 6 = 7
9. 18 ÷ 6 = 3
10. 24 ÷ 6 = 4
11. 42 ÷ 6 = 7
12. 36 ÷ 6 = 6
13. 24 ÷ 6 = 4
14. 30 ÷ 6 = 5
15. 12 ÷ 6 = 2

186

Unit 3 Section 1 Lesson 3

Multiplying: Sets of Seven to 7 × 7

Materials

- for each child
  - 49 counters
  - paper plates
  - dot paper: Program Master 2
  - multiplication chart, reproduced from Program Master 24
- dice, one marked 6, 6, 7, 7, 7, 7
  one marked 0, 1, 3, 4, 5, 6

Lesson

1

Gather the children around the working area and distribute the counters and paper plates.
Write on the easel
2 × 7 =
Have the children arrange their counters in two sets of seven.
Ask a child to tell the number of sets, the number of counters in each set and the number of counters altogether.
Record on the easel

The number of sets		*The number in each set*		*The number altogether*
2	×	7	=	14

Repeat the procedure, developing each of the multiplication facts of seven, from 0 × 7 to 7 × 7, and recording each multiplication sentence under the same headings.

The number of sets		*The number in each set*		*The number altogether*
2	×	7	=	14
5	×	7	=	35
4	×	7	=	28
0	×	7	=	0
7	×	7	=	49
1	×	7	=	7
6	×	7	=	42
3	×	7	=	21

2

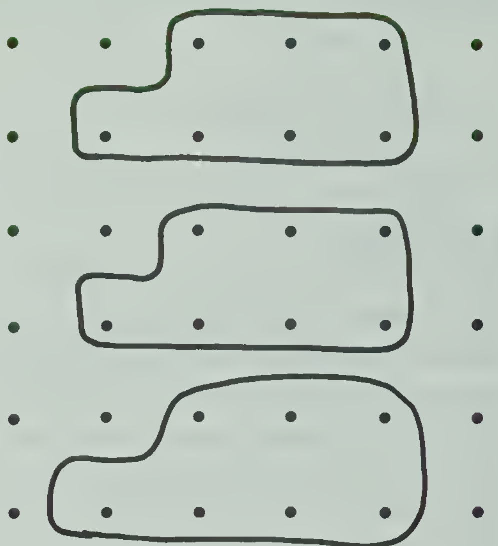
Erase the products of the multiplication sentences developed during activity 1. Have children who remember the product for the sentences come to the easel and write them in the appropriate location.

3

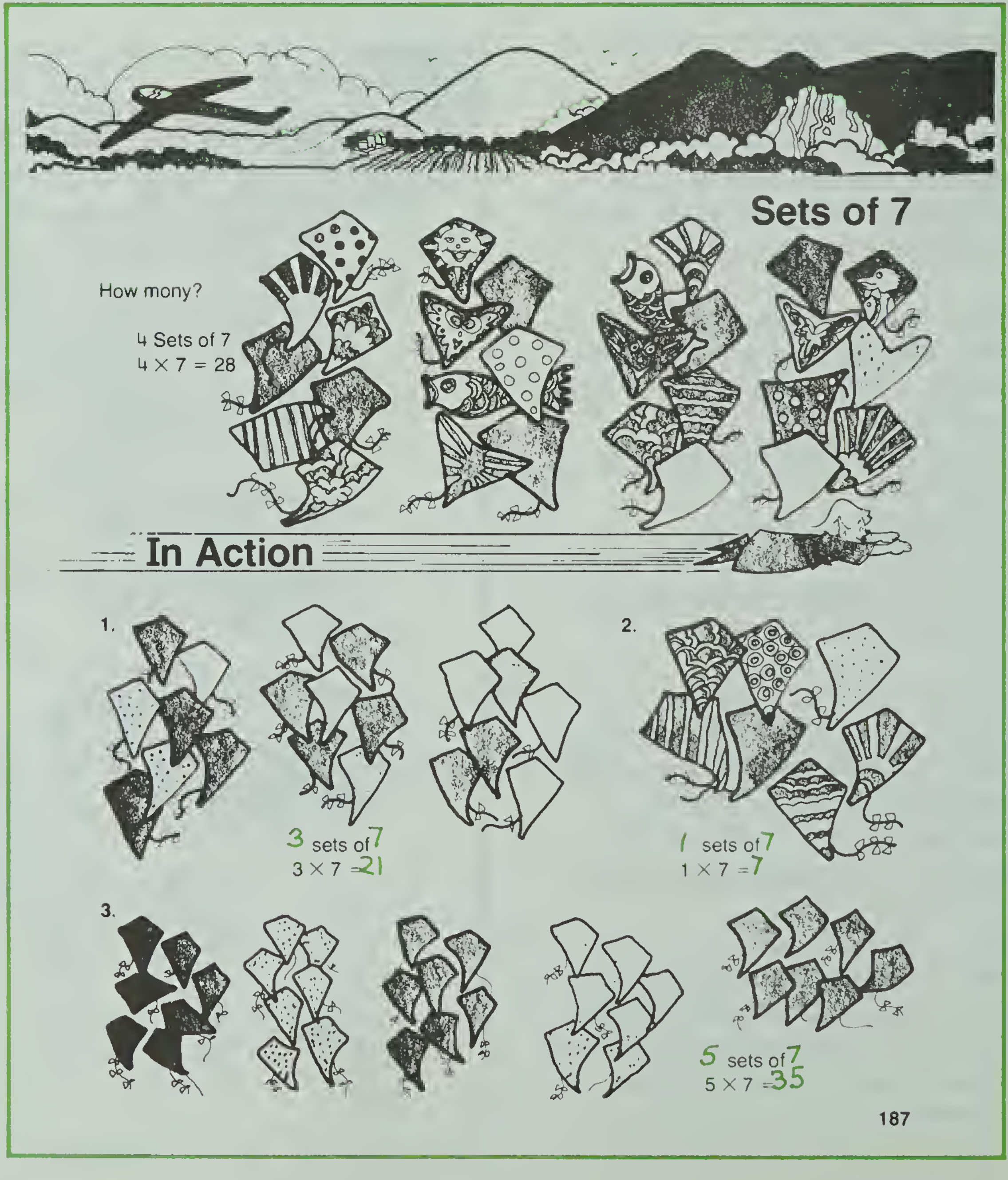
Review the relationship between multiplication and repeated addition. Pointing to the sentence 2 × 7 = 14, ask a child how many sevens are added together. Write on the easel
7 + 7 =
Have a child add and fill in the sum. Explain that two times seven means seven plus seven, emphasizing that both equal 14. Repeat for other multiplication facts on the easel.

4

Distribute dot paper and have the children loop sets of seven for each multiplication fact to 7 × 7, cut out the sections of dot paper, glue them in their notebooks and label each with the appropriate multiplication fact.



3 x 7 = 21



Sets of 7

How mony?

4 Sets of 7
4 × 7 = 28

In Action

1.

3 sets of 7
3 × 7 = 21

2.

1 sets of 7
1 × 7 = 7

3.

5 sets of 7
5 × 7 = 35

187

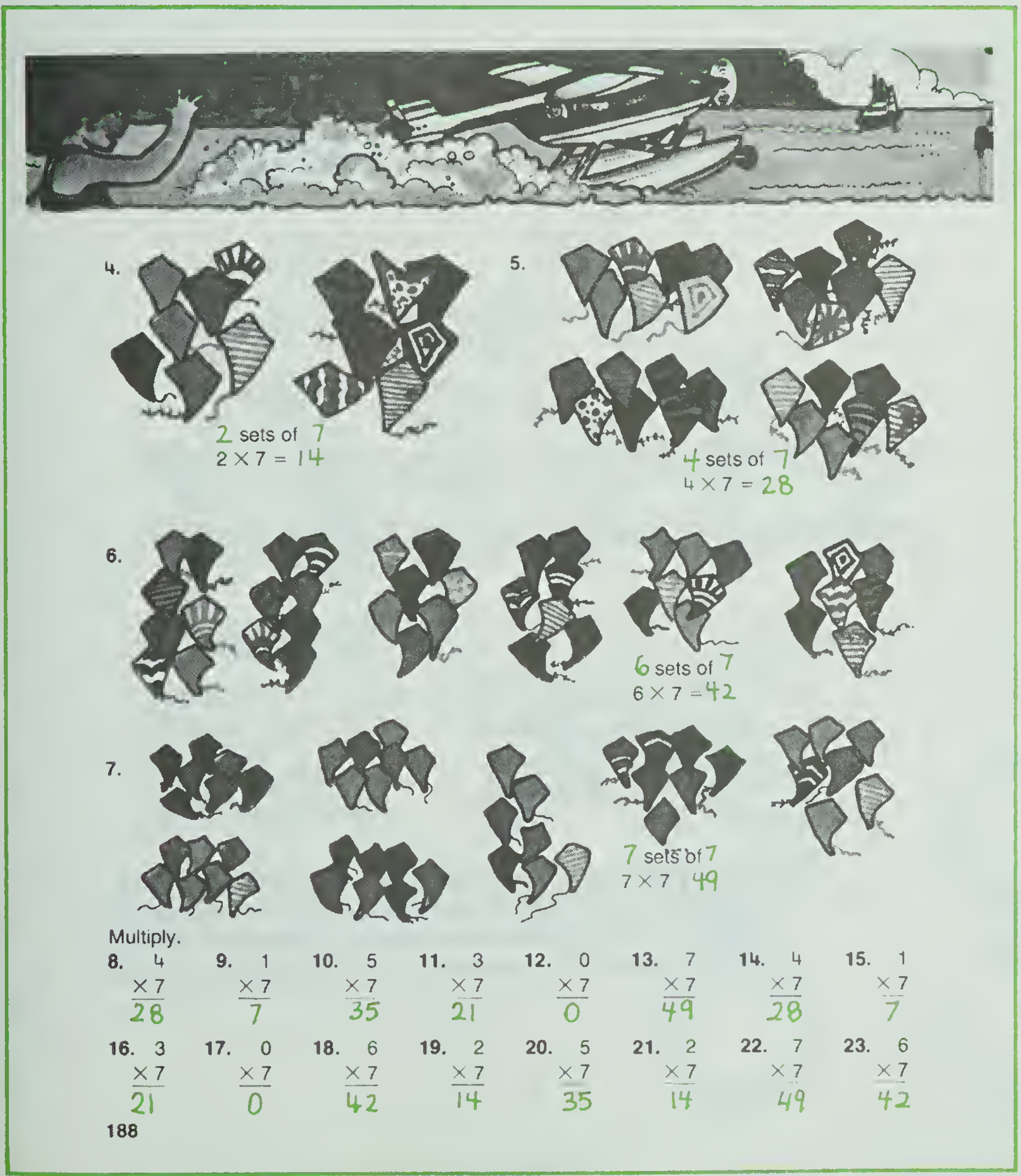
5

Give each child a multiplication chart to complete.

X	0	1	2	3	4	5	6	7
0								
1								
2								
3								
4								
5								
6								
7								

Have the children search for and discuss the resulting patterns. For example

- There are zeros in the row and column for 0.
- The numbers in the row and column for one show counting by ones.
- The numbers in the row and column for 2 show counting by twos.
- The numbers in the row and column for 3 show counting by threes.
- If a diagonal line is drawn from the top left corner to the bottom right corner, the two sides match.



4. 2 sets of 7
2 × 7 = 14

5. 4 sets of 7
4 × 7 = 28

6. 6 sets of 7
6 × 7 = 42

7. 7 sets of 7
7 × 7 49

Multiply.

8. $\begin{array}{r} 4 \\ \times 7 \\ \hline 28 \end{array}$
9. $\begin{array}{r} 1 \\ \times 7 \\ \hline 7 \end{array}$
10. $\begin{array}{r} 5 \\ \times 7 \\ \hline 35 \end{array}$
11. $\begin{array}{r} 3 \\ \times 7 \\ \hline 21 \end{array}$
12. $\begin{array}{r} 0 \\ \times 7 \\ \hline 0 \end{array}$
13. $\begin{array}{r} 7 \\ \times 7 \\ \hline 49 \end{array}$
14. $\begin{array}{r} 4 \\ \times 7 \\ \hline 28 \end{array}$
15. $\begin{array}{r} 1 \\ \times 7 \\ \hline 7 \end{array}$
16. $\begin{array}{r} 3 \\ \times 7 \\ \hline 21 \end{array}$
17. $\begin{array}{r} 0 \\ \times 7 \\ \hline 0 \end{array}$
18. $\begin{array}{r} 6 \\ \times 7 \\ \hline 42 \end{array}$
19. $\begin{array}{r} 2 \\ \times 7 \\ \hline 14 \end{array}$
20. $\begin{array}{r} 5 \\ \times 7 \\ \hline 35 \end{array}$
21. $\begin{array}{r} 2 \\ \times 7 \\ \hline 14 \end{array}$
22. $\begin{array}{r} 7 \\ \times 7 \\ \hline 49 \end{array}$
23. $\begin{array}{r} 6 \\ \times 7 \\ \hline 42 \end{array}$

188

Written and Other Activities

☐

mathways 3, pages 187, 188

Before assigning the In Action questions, have a child read the example and tell what each of the numbers in the multiplication sentence refers to. Encourage the children to use repeated addition or counters to help them find products they can't remember when doing the In Action questions.

☐ ☐

Have the children write repeated addition sentences for several of the multiplication questions completed for pages 187 and 188.

☐ ☐ ☐

Using the marked dice described under Materials, roll the dice, call out the number pair and have the children record only the product. Repeat two or three times. Then invite children to roll the dice and call out the number pairs. Continue until several children have had a turn and all the multiplication facts to 7 × 7 have been reviewed.

☐ ☐ ☐ ☐

Give each child a multiplication chart such as the one completed for activity 5, but this time record the factors along the top and side of the chart in a different order. Have the children complete the chart.

Discuss the resulting patterns.

☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 36

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 56

Unit 3 Section 1 Lesson 4

Dividing by Seven to 49 ÷ 7

Materials

- for each child
  - 49 counters
  - seven paper plates
  - dot paper: Program Master 2
- die marked 14, 21, 28, 35, 42, 49

Lesson

1

Gather the children into the working area and distribute the counters and paper plates. Say

Three times seven.

Ask the children to arrange counters in sets to illustrate. Ask a child to tell the number of sets, the number of counters in each set and the number of counters altogether. Record on the easel.

3 sets of 7 equals 21
3 times 7 equals 21
$3 \times 7 = 21$

Then discuss how three sets of seven show a division fact, asking how many counters altogether, how many in each set and how many sets. Record the children's responses in the following manner:

21 divided into sets of 7 makes 3 sets
21 divided by 7 equals 3
$21 \div 7 = 3$

Repeat, relating multiplication and division for the remaining division facts to 49 ÷ 7.

2

Give each child a sheet of dot paper reproduced from Program Master 2. Have the children cut out a section having the appropriate number of dots for each division fact from 7 ÷ 7 to 49 ÷ 7, loop sets of seven dots, glue the sections in their notebooks and label each with the corresponding division and multiplication fact.

$2 \times 7 = 14$
$14 \div 7 = 2$

3

Have the children gather round and toss the marked die. Ask a child in the group to give a division sentence with the number on the upturned face of the die divided by seven. Have another child record the sentence on the easel.

$35 \div 7 = 5$

Invite children in the group to roll the die and pick other children to write the corresponding division sentence on the easel. When all the children have had a turn, focus attention on the easel and have children suggest multiplication sentences that correspond with the division sentences.

Written and Other Activities

☐

mathways 3, page 189

Have children read and explain the meaning of the example at the top of the page. Assign the In Action questions.

☐ ☐

Have the children write multiplication sentences for each of the division questions on page 189.

☐ ☐ ☐

Have the children make up story problems for some of the questions on page 189.

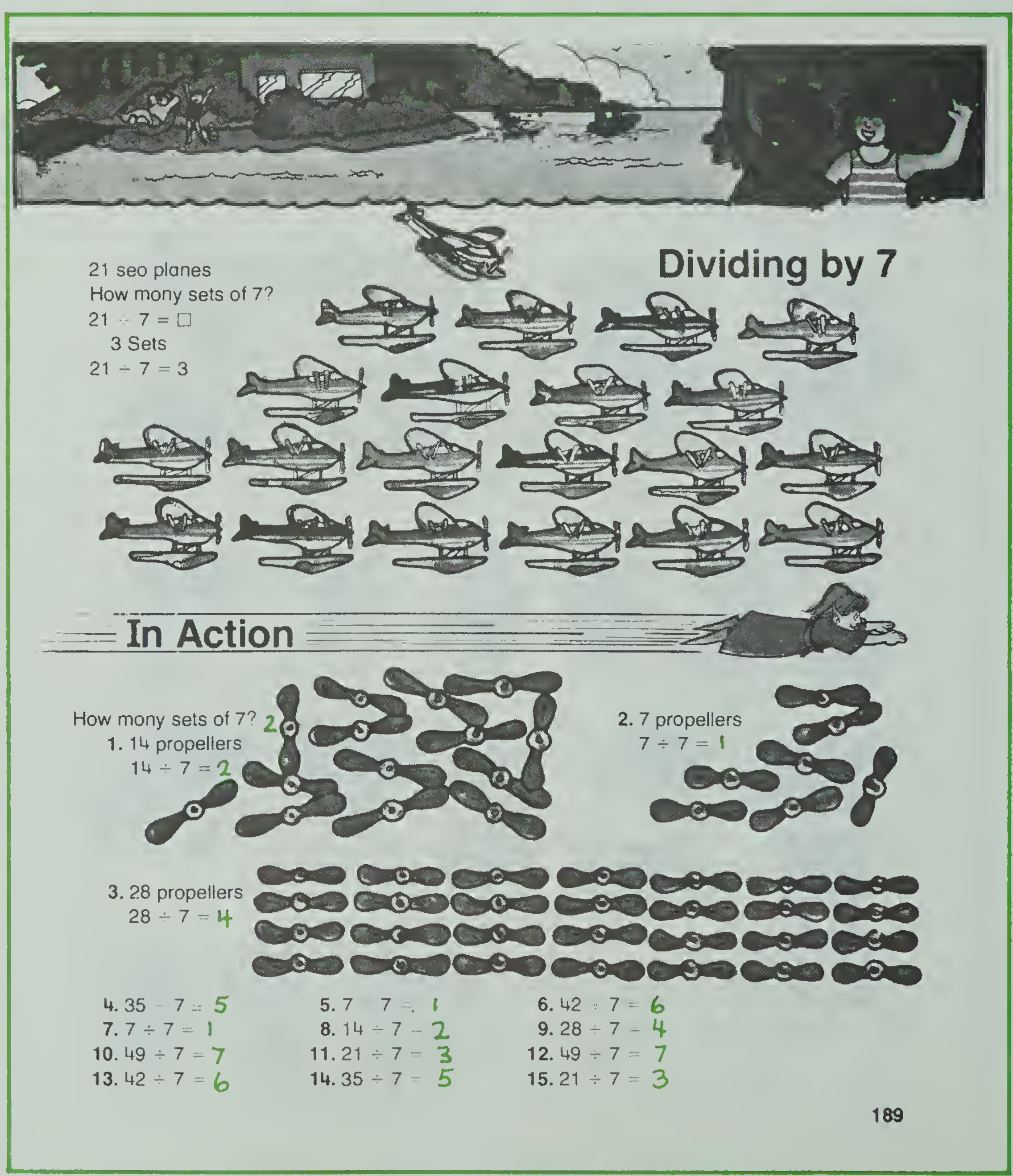
Have the children illustrate their problems, then exchange papers with other children. Each child solves the problems written and illustrated by another child. The papers are exchanged again for checking. Display several of these in the classroom.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 37

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 57



Dividing by 7

21 sea planes
How many sets of 7?
21 ÷ 7 = ☐
3 Sets
21 ÷ 7 = 3

In Action

How many sets of 7? 2

1. 14 propellers
14 ÷ 7 = 2

2. 7 propellers
7 ÷ 7 = 1

3. 28 propellers
28 ÷ 7 = 4

4. 35 ÷ 7 = 5
5. 7 ÷ 7 = 1
6. 42 ÷ 7 = 6
7. 7 ÷ 7 = 1
8. 14 ÷ 7 = 2
9. 28 ÷ 7 = 4
10. 49 ÷ 7 = 7
11. 21 ÷ 7 = 3
12. 49 ÷ 7 = 7
13. 42 ÷ 7 = 6
14. 35 ÷ 7 = 5
15. 21 ÷ 7 = 3

189

Unit 3 Section 2 Lesson 1

Telling Time: One-Minute Intervals, Earlier and Later

Materials

- demonstration clock, real or cardboard
- large clock with second hand
- model clocks made for *mathways 3* page 35
- for each child
  - copy of Program Master 25

Lesson

1

Invite the children to join you in the working area. Using the demonstration clock, review the familiar intervals. Show 10:45 on the clock and ask

What is the last hour the hour hand has passed?

How many minutes past the hour is the minute hand?

Appoint a child to count by fives to 45 as another child points to the numerals on the clock. Then record the time on the easel in two ways.

10:45 *ten forty-five*

Invite the children to suggest other hour-and-five-minute times to show on the clock, and have children record these times on the easel in two ways.

2

Write on the easel

7:35

and ask a child to read the time and then show it on the demonstration clock. Point out that since the time is not exactly seven o'clock, but is past seven, the hour hand has moved past the 7. Have each child in the group write a time on the easel and appoint another child to read the time and show it on the clock.

3

Introduce the one-minute interval. Show 7:10 on the clock and have a child read the time. Then move the minute hand to 7:11 and ask

How many minutes has the minute hand moved?

What time is one minute more than 7:10?

Repeat, moving the hand 1 min at a time to 7:15 and having the children say the time after each move.

Show 8:10 on the clock and repeat.

Continue the activity, beginning always with the same five-minute interval, but varying the hour several times.

4

Show times on the demonstration clock and have children state the time and write it on the easel in two ways.

4:25 *four twenty-five*

6:56 *six fifty-six*

5

Write various times on the easel.

9:34 *10:47* *6:22* *8:41*

Select children to read the times and show them on the clock. Discuss the position of the hour hand each time.

6

Show 3:05 on the clock.

Carla, what time does the clock show?

Show the time that is 12 min later than 3:05.

Remind the children that both the minute and hour hands must move.

What time is it now, Dominic?

Repeat the activity several times. Include examples that result in a change in the hour.

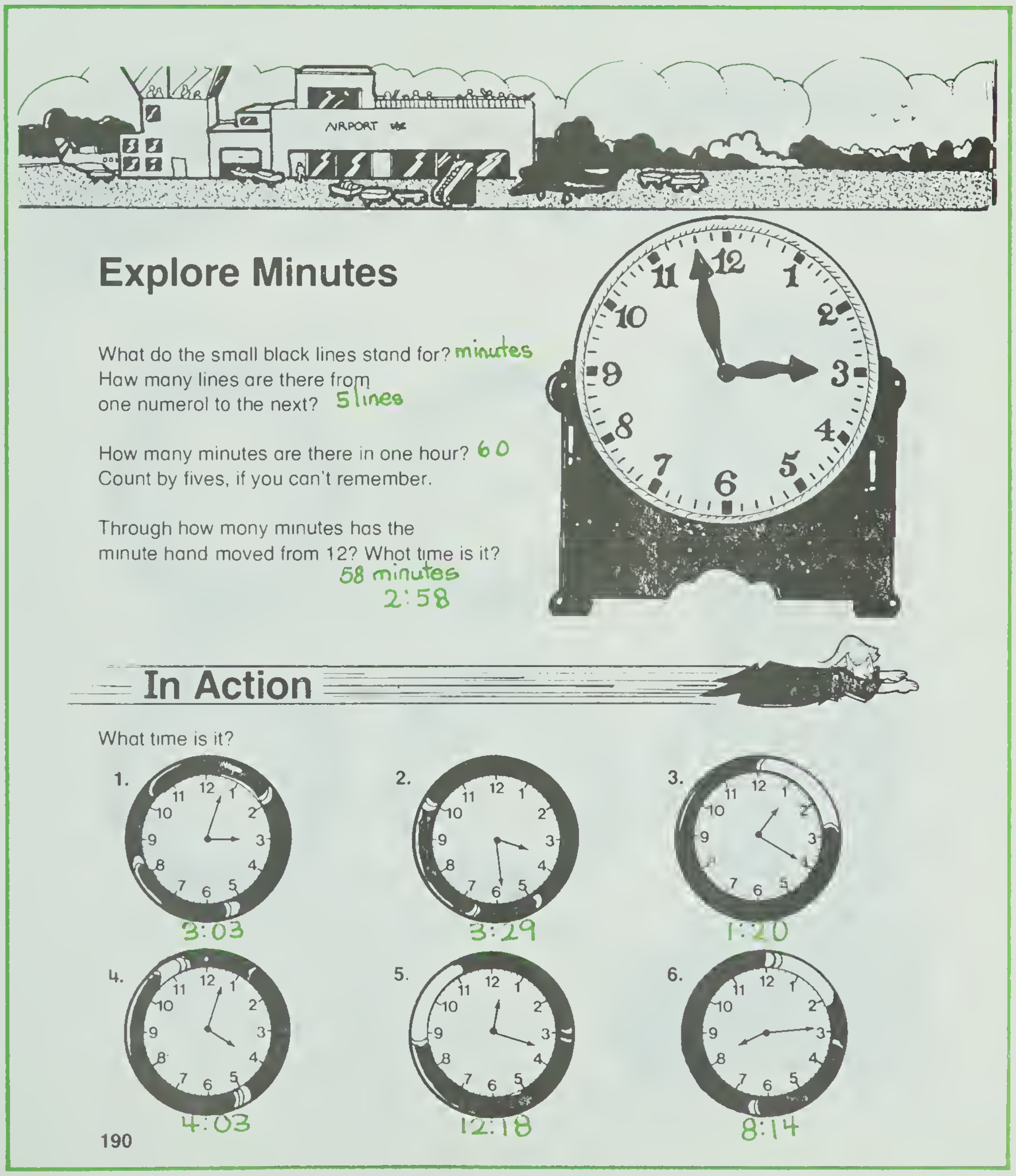
Show the time that is 7 min later than 4:56.

What time is it now?

7

Show 6:38 on the demonstration clock.

Paul, show the time that is 6 min earlier than 6:38.



Explore Minutes

What do the small black lines stand for? minutes

How many lines are there from one numeral to the next? 5 lines

How many minutes are there in one hour? 60

Count by fives, if you can't remember.

Through how many minutes has the minute hand moved from 12? What time is it?

58 minutes

2:58

In Action

What time is it?

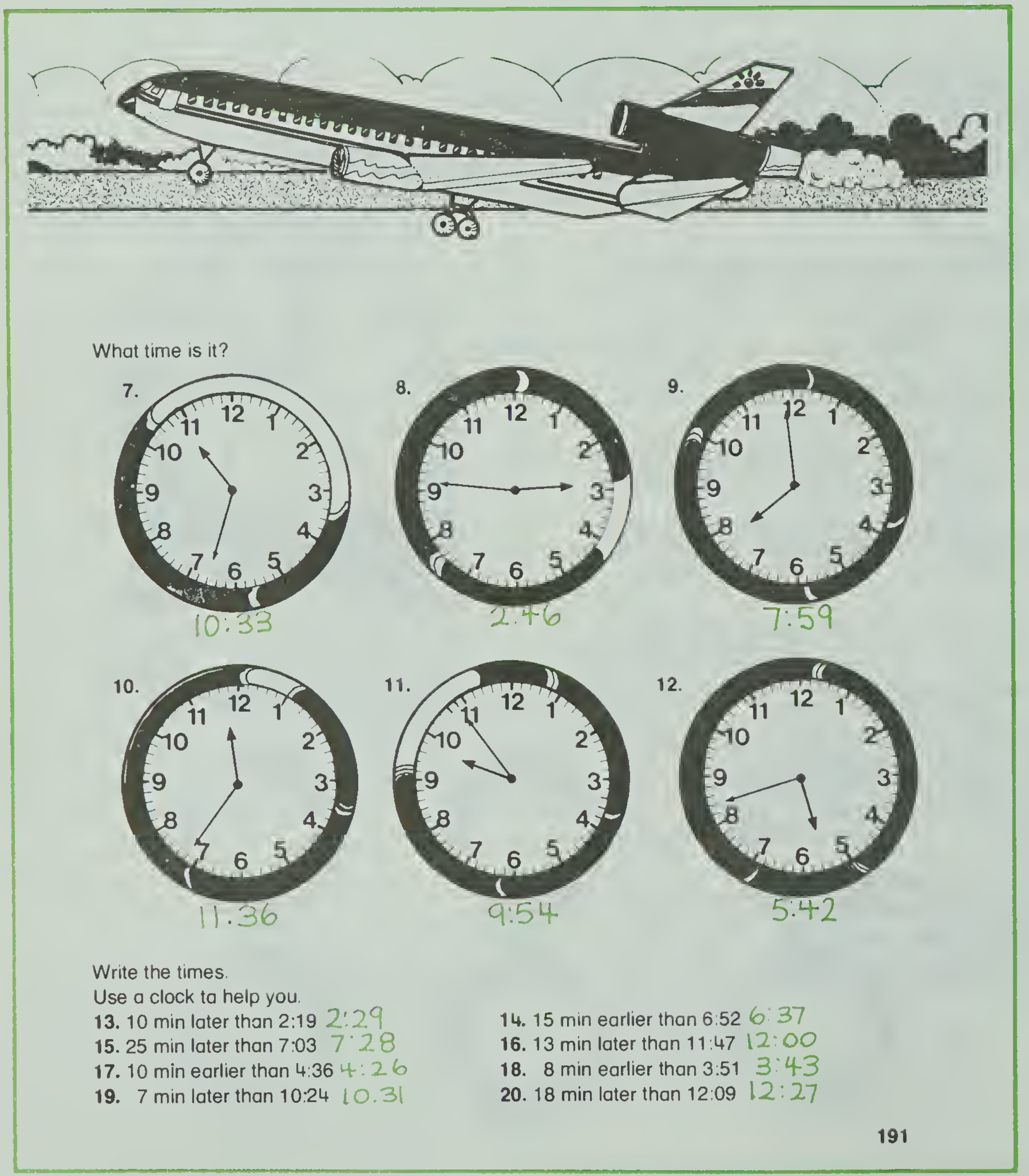
1. 3:03
2. 3:29
3. 1:20
4. 4:03
5. 12:18
6. 8:14

190

What time is it now, Paul?
Repeat the activity several times. Include examples that result in a change in the hour.
Show 11 min earlier than 2:01.

8
Show the clock with the second hand and discuss how it works. Then have the children close their eyes until they think 1 min has elapsed. After the children open their eyes, they check the second hand on the clock to see if they have estimated correctly. Then have the children watch the second hand and count silently
One thousand and one, one thousand and two, . . . one thousand and sixty.
After they have practised a few times, have the children close their eyes again and estimate the length of 1 min.

9
Ask each child in the group to record an estimate of how many minutes it would take to walk around the classroom three times. Have each child report the estimate to the group, then have a child walk around the classroom as the other children time the walk on the clock with the second hand. Have each child record the actual time taken beside the estimate, to the nearest minute.
Comparing estimated and actual times should help the children to become more accurate in estimating the elapse of minutes.



What time is it?

7. 10:33

8. 2:46

9. 7:59

10. 11.36

11. 9:54

12. 5:42

Write the times.
Use a clock to help you.

13. 10 min later than 2:19 2:29
14. 15 min earlier than 6:52 6:37
15. 25 min later than 7:03 7:28
16. 13 min later than 11:47 12:00
17. 10 min earlier than 4:36 4:26
18. 8 min earlier than 3:51 3:43
19. 7 min later than 10:24 10.31
20. 18 min later than 12:09 12:27

191

Written and Other Activities

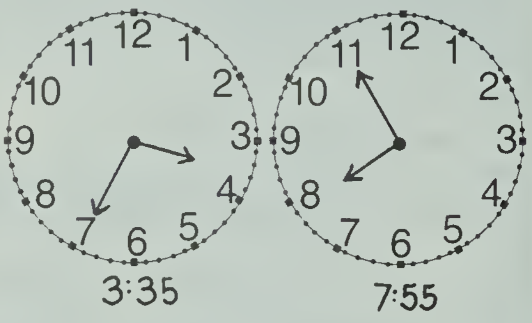
☐

mathways 8, pages 190, 191
Discuss the Explore section. Provide clock faces reproduced from Program Master 25 for questions 13 to 20.

☐ ☐

You may wish to send home a letter to keep parents informed of what is happening in the mathematics class. The following may serve as a model.

Dear Parent or Guardian;
We have been learning a very important concept – how to tell time. Earlier in the year, we learned the hour and the 5 min interval. Now we are learning about 1 min intervals. Grade threes do not talk about time "after" or "to" an hour – rather they say the hour and then the number of minutes which have passed since the hour.



You can help by frequently having your child tell you the time this way. Use an alarm clock and have him or her read the time as you set the hands in different positions.
Play a game. Look for clocks when you are out driving. The first one to spot a clock and read the time gains a point. Helping a child develop accuracy and speed in telling time usually takes patience on the part of the interested adult – perseverance on the part of the child. Remember to keep practice sessions short.

Unit 3 Section 2 Lesson 2

Solving Problems about Time

Materials

- demonstration clock face

Lesson

1

Invite the children into the working area to play a game.

I am thinking of a time.
The hour hand is pointing just past the 2 and the minute hand is pointing to the 4.
What time am I thinking of?

Have a child show the time on the demonstration clock and state the time shown on the clock.

Repeat the activity a few times. Then have children take turns describing the positions of the hands and the other children identify the indicated times.

2

Vary the game described in the first activity as follows:

I am thinking of a time.
Earlier, the hour hand was just past the 7 and the minute hand was pointing at the 1.
Now the time is 12 min later.
What time is it?

3

Vary the game again.

I am thinking of a time.
In four minutes, the hour hand will point past the 9 and the minute hand will point to the 12. What time am I thinking of?
What time will it be four minutes later?

4

State a problem such as the following:

This morning I caught the bus at 8:12. I arrived at school 12 min later. What time did I arrive at school?

The first child to identify the time makes up the next problem for the group to solve. Assist the children if necessary, and encourage them to make up problems relating to their own lives.

Written and Other Activities

☐

mathways 3, page 192

Have different children read two or three problems and discuss them. Allow children to use the demonstration clock to solve the problems if necessary, or have them draw two clocks for each question.

☐ ☐

Have the children write one or two problems such as those on *mathways* 3 page 192. Each child exchanges problems with another child and identifies the times indicated in complete sentences.

Fiona went to bed at 9:14.
Emmanuel ate supper at 5:52.

☐ ☐ ☐

As enrichment, have the children write out problems in which two times are given, and the task is to identify the time interval. For example

Leah arrived at school at 1:14.
She began painting a picture at 2:15.
How long after Leah arrived at school did she start painting the picture?

If writing out the problems is too difficult, create five similar problems for the children to solve.

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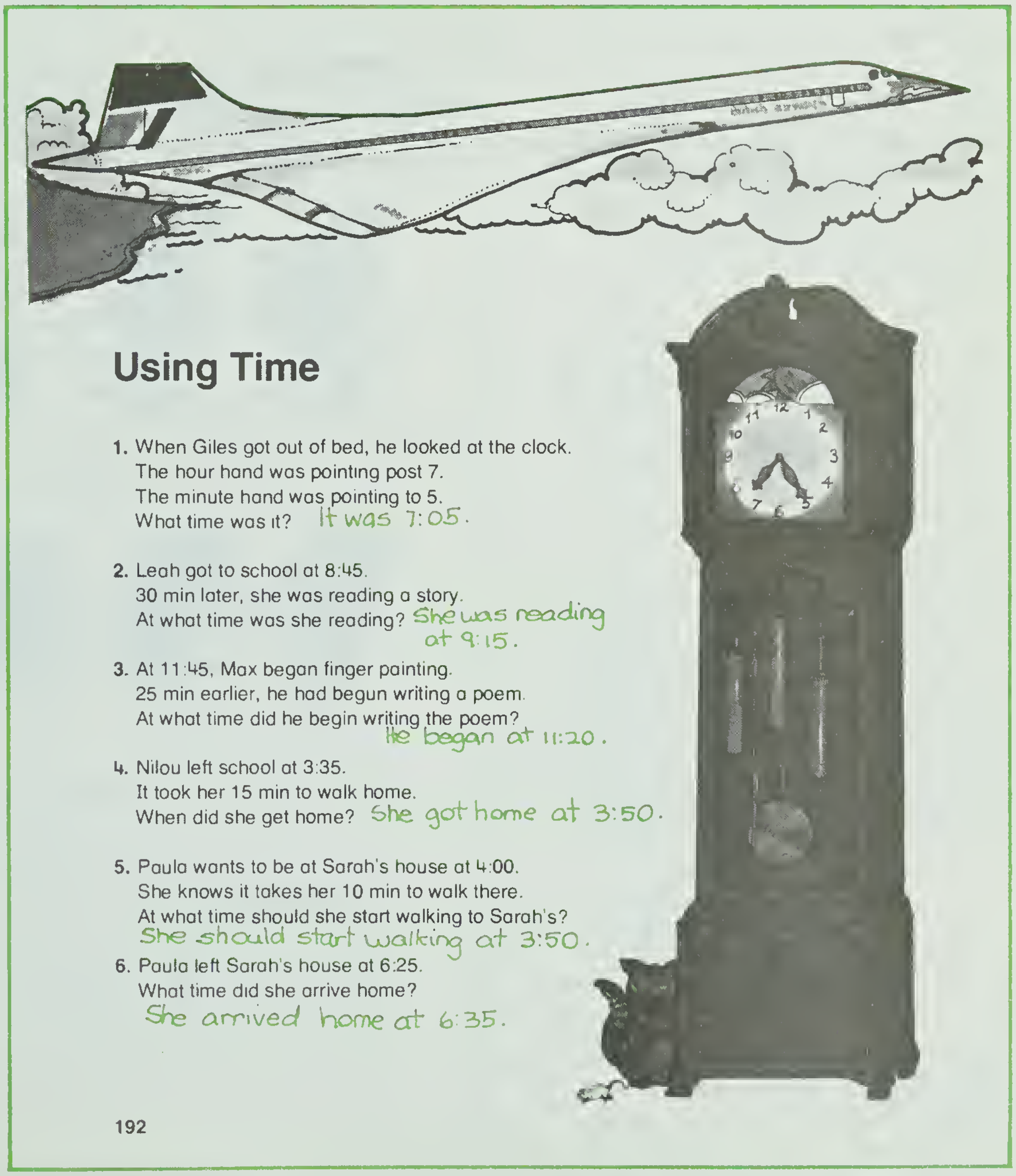
mathways 3 Practice Masters pages 38 and 39

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 58 and 59



Using Time

1. When Giles got out of bed, he looked at the clock.
The hour hand was pointing past 7.
The minute hand was pointing to 5.
What time was it? It was 7:05.

2. Leah got to school at 8:45.
30 min later, she was reading a story.
At what time was she reading? She was reading at 9:15.

3. At 11:45, Max began finger painting.
25 min earlier, he had begun writing a poem.
At what time did he begin writing the poem?
He began at 11:20.

4. Nilou left school at 3:35.
It took her 15 min to walk home.
When did she get home? She got home at 3:50.

5. Paula wants to be at Sarah's house at 4:00.
She knows it takes her 10 min to walk there.
At what time should she start walking to Sarah's?
She should start walking at 3:50.

6. Paula left Sarah's house at 6:25.
What time did she arrive home?
She arrived home at 6:35.

192

Unit 3 Section 2 Lesson 3

Writing Equivalent Multiplication Sentences

Materials

- counters
- stencils

Rationale

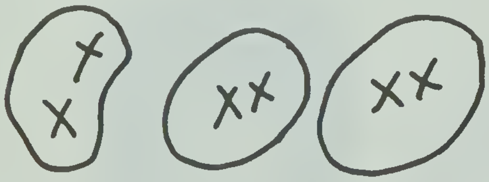
Understanding the commutative property of multiplication, without learning the terminology, helps children to learn multiplication facts by reducing the number of facts to be learned. For example, once the children learn that six sets of five are the same as five sets of six or, in an array, six rows of five are the same as five rows of six, the corresponding multiplication facts are seen as equivalent. Therefore, when the children have memorized $6 \times 5 = 30$, they already know that $5 \times 6 = 30$.

Lesson

1

Gather the children around the working area and place 35 counters in the centre. Have each child show three sets of two counters.

How many counters are there altogether?

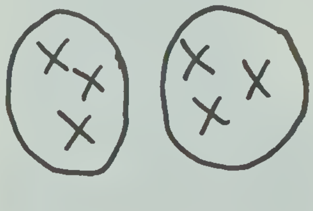


Record on the easel

3 sets of 2 are 6

$3 \times 2 = 6$

Discuss with the children that the first number in a multiplication sentence shows the number of sets, and the second number shows the number of objects in each set. Have the children show two sets of three counters and tell the number of counters altogether.



Record on the easel

2 sets of 3 are 6

$2 \times 3 = 6$

Compare the information on the easel, emphasizing that the same group of six counters can be arranged in sets of two or three.

2

Repeat the preceding activity several times, having the following equivalent sentences illustrated.

$5 \times 7 = 35 \qquad 7 \times 5 = 35$
$6 \times 4 = 24 \qquad 4 \times 6 = 24$
$1 \times 2 = 2 \qquad 2 \times 1 = 2$
$0 \times 3 = 0 \qquad 3 \times 0 = 0$

Discuss with the children how equivalent multiplication sentences can help us learn multiplication facts.

If we know that seven sets of four counters equals 28, what multiplication sentence can we write?

$7 \times 4 = 28$

What other sentence can we write?

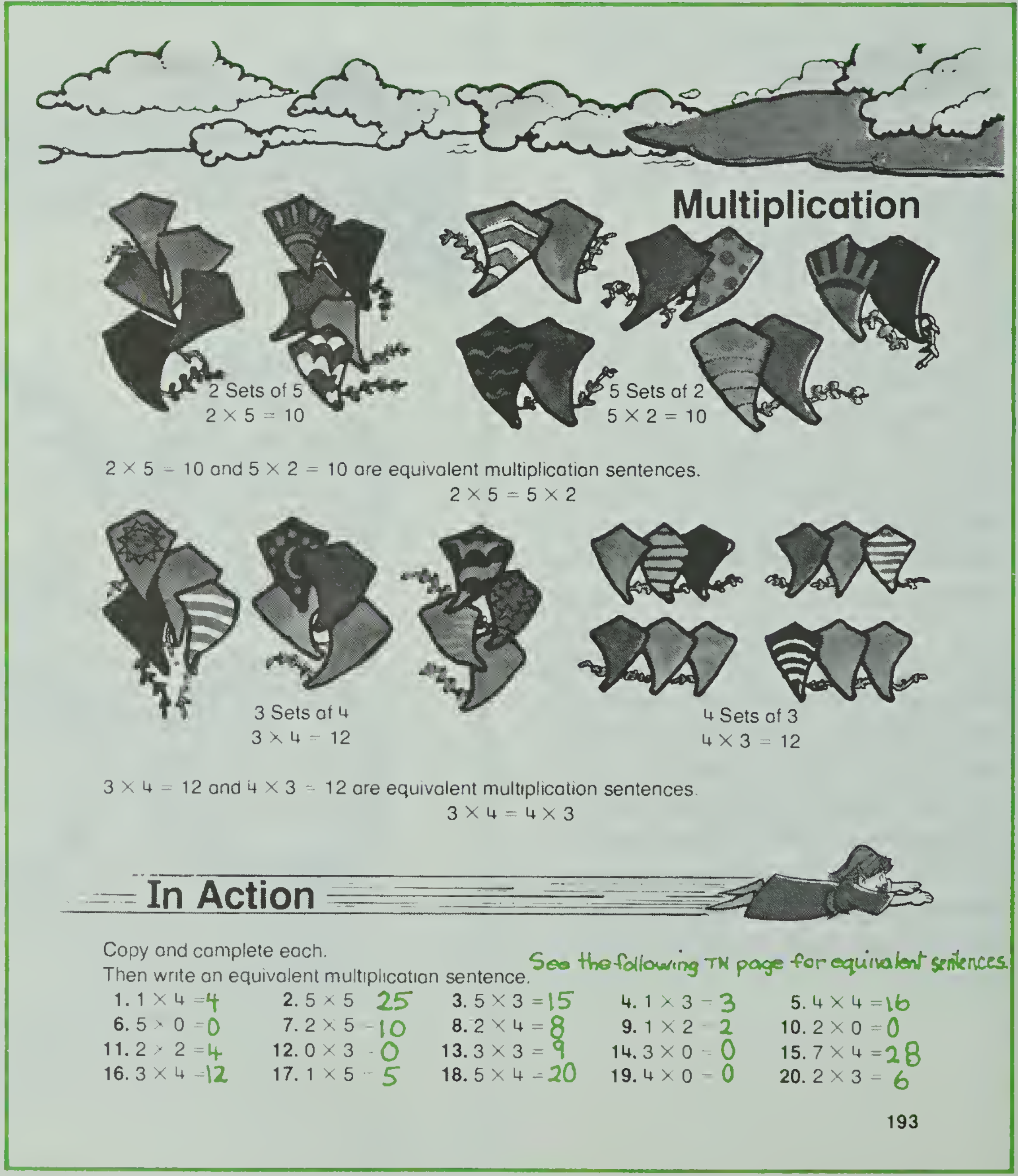
$4 \times 7 = 28$

3

Have the children draw sets of objects to illustrate pairs of equivalent multiplication facts. Have them label each drawing with the corresponding fact.

4

Have the children prepare personal charts listing the multiplication facts to be learned during the week. Every child's chart will likely be different. Explain that every day each child will be asked the facts listed on the chart three times. If the recall is rapid and accurate, a check will be placed in the appropriate box. Friends can question



2 Sets of 5
$2 \times 5 = 10$

5 Sets of 2
$5 \times 2 = 10$

$2 \times 5 = 10$ and $5 \times 2 = 10$ are equivalent multiplication sentences.
$2 \times 5 = 5 \times 2$

3 Sets of 4
$3 \times 4 = 12$

4 Sets of 3
$4 \times 3 = 12$

$3 \times 4 = 12$ and $4 \times 3 = 12$ are equivalent multiplication sentences.
$3 \times 4 = 4 \times 3$

In Action

Copy and complete each.
Then write an equivalent multiplication sentence.

See the following TN page for equivalent sentences.

1. $1 \times 4 = 4$ 2. 5×5 25 3. $5 \times 3 = 15$ 4. $1 \times 3 = 3$ 5. $4 \times 4 = 16$
6. $5 \times 0 = 0$ 7. $2 \times 5 = 10$ 8. $2 \times 4 = 8$ 9. $1 \times 2 = 2$ 10. $2 \times 0 = 0$
11. $2 \times 2 = 4$ 12. $0 \times 3 = 0$ 13. $3 \times 3 = 9$ 14. $3 \times 0 = 0$ 15. $7 \times 4 = 28$
16. $3 \times 4 = 12$ 17. $1 \times 5 = 5$ 18. $5 \times 4 = 20$ 19. $4 \times 0 = 0$ 20. $2 \times 3 = 6$

193

Facts	Monday			Tuesday			Wednesday			Thursday			Friday		
3 × 3 = 9															
4 × 3 = 12															
4 × 4 = 16															
5 × 3 = 15															
5 × 4 = 20															
6 × 5 = 30															
6 × 6 = 36															

Additional Answers

1. 4 × 1 = 4
2. 5 × 5 = 25
3. 3 × 5 = 15
4. 3 × 1 = 3
5. 4 × 4 = 16
6. 0 × 5 = 0
7. 5 × 2 = 10
8. 4 × 2 = 8
9. 2 × 1 = 2
10. 0 × 2 = 0
11. 2 × 2 = 4
12. 3 × 0 = 0
13. 3 × 3 = 9
14. 0 × 3 = 0
15. 4 × 7 = 28
16. 4 × 3 = 12
17. 5 × 1 = 5
18. 4 × 5 = 20
19. 0 × 4 = 0
20. 3 × 2 = 6

each other in class for two of the sections, and a parent or a friend can question the children after school for the other section. A new chart will be made the following week, listing a new group of multiplication facts to be learned. The new chart may include some of the facts from the previous week's chart.

Suggest to the children that they tape a sheet of paper listing two or three pairs of equivalent facts to their desks to look at frequently. After a few days, the children can change the facts on the paper.

5

Appoint children to contribute illustrations of multiplication facts for display in the classroom. Each of three children could contribute a fact for display on Monday, a different group of children can suggest the facts for Tuesday, and so on. Refer to the displayed facts frequently, emphasizing the equivalent facts that can be inferred.

Written and Other Activities

□

mathways 3, page 193

Relate each example on the page to its illustration. Discuss the fact that since 2 × 5 and 5 × 2 both equal 10, 2 × 5 = 5 × 2.

Introduce the word *equivalent* and have two or three children tell its meaning in their own words. Assign the In Action questions.

□ □

To emphasize the commutative property of multiplication, prepare a stencil such as the following:

4 × 6 = 6 × □
5 × □ *= 7 × 5*
□ *× 3 = 3 × 2*
1 × 5 = □ *× 1*

Distribute copies and have the children complete the questions.

□ □ □

A question sheet such as the following is useful in providing the background for multiplication facts to be introduced later, and for giving children additional experience in using the commutative property of multiplication to extend their store of multiplication facts:

1. 8 × 4 = 32   4 × 8 = □
2. 7 × 8 = 56   8 × 7 = □
3. 6 × 9 = 54   9 × 6 = □
4. 9 × 4 = 36   4 × 9 = □
5. 7 × 9 = 63   9 × 7 = □
6. 3 × 9 = 27   9 × 3 = □
7. 8 × 5 = 40   5 × 8 = □
8. 6 × 8 = 48   8 × 6 = □
9. 2 × 9 = 18   9 × 2 = □
10. 9 × 8 = 72   8 × 9 = □

Unit 3 Section 2 Lesson 4

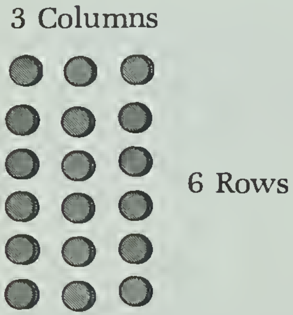
Writing Equivalent Multiplication Sentences, Using Rows and Columns to Represent Multiplication Sentences

Materials

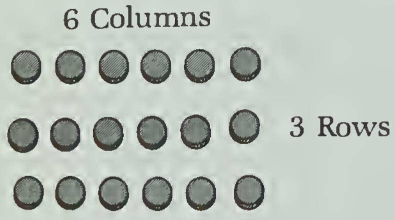
- counters
- seven pieces of string
- a sheet of paper
- cards with numerals 0 to 9
- multiplication expression cards, *see* ☐ ☐ ☐ ☐ ☐ ☐

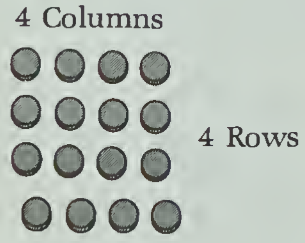
Rationale

Arranging or drawing counters in rows and columns provides another way to represent multiplication and division facts. One arrangement in rows and columns shows two multiplication sentences and two division sentences, unless the factors for the multiplication sentence are the same. If the factors are the same, the arrangement shows one multiplication sentence and one division sentence.



The above picture has six rows of three. It shows 6 × 3 = 18 and 18 ÷ 3 = 6. When turned sideways the picture has three rows of six. It shows 3 × 6 = 18 and 18 ÷ 6 = 3.



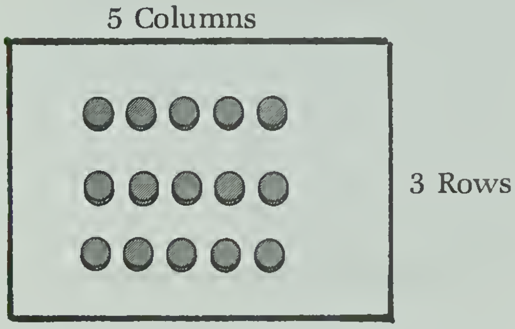


The above picture has four rows of four. It shows 4 × 4 = 16 and 16 ÷ 4 = 4. When turned sideways, it still has four rows of four.

Lesson

1

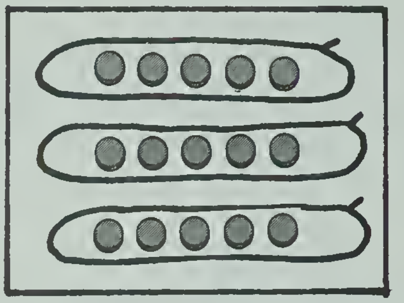
On a piece of paper, arrange 15 counters in three rows and five columns.



Point out the rows and then point out the columns. Ask for the number of rows, the number of columns, and the number of counters. Write the following on the easel.

3 rows of 5 equals 15

Use string to loop the counters in each row.

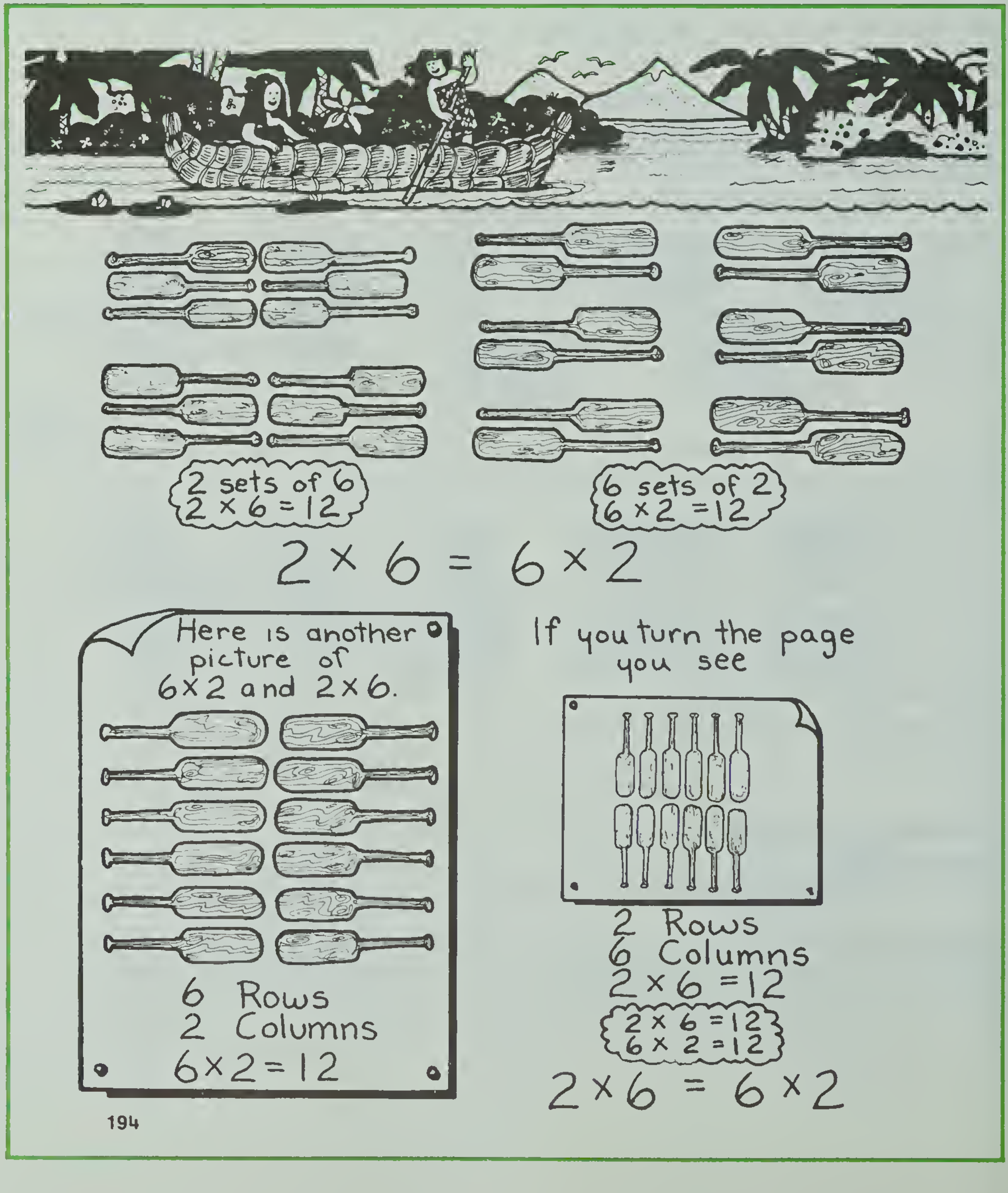


Ask for the number of sets, the number in each set, the number of counters, and a multiplication sentence for this. Write this on the easel.

3 sets of 5 equals 15

3 × 5 = 15

Point out that three rows of five and three sets of five each equal 15.



2 sets of 6
2 × 6 = 12

6 sets of 2
6 × 2 = 12

2 × 6 = 6 × 2

Here is another picture of 6×2 and 2×6.

6 Rows
2 Columns
6×2=12

If you turn the page you see

2 Rows
6 Columns
2×6=12

2×6=12
6×2=12

2×6 = 6×2

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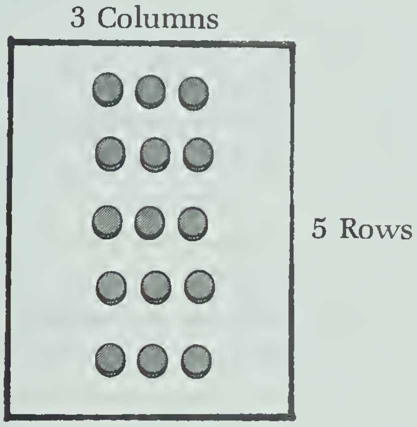
Explain that arranging counters in rows and columns is another way to show multiplication.

2

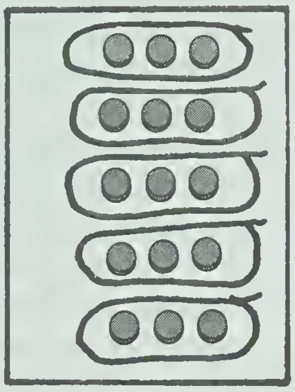
Turn the paper to show five rows of three.



Ask for the number of rows, the number of columns, and the number altogether. Record this on the easel.

5 rows of 3 equals 15

Use string to loop the counters in each row.



Ask for the number of sets, the number in each set, the number altogether, and a multiplication sentence for this. Write this on the easel.

5 sets of 3 equals 15

$5 \times 3 = 15$

Discuss that five rows of three, five sets of three, three rows of five, and three sets of five each equal 15.

3

Arrange eight counters in two rows of four on the piece of paper. Ask for the number of rows, the number of columns, the number altogether, and two multiplication sentences for this picture.

$2 \times 4 = 8$

$4 \times 2 = 8$

Repeat this activity for one row of six ($1 \times 6 = 6$ and $6 \times 1 = 6$).

Arrange nine counters making three rows of three on the piece of paper. Ask for the number of rows, the number of columns, the number altogether, and a multiplication sentence for the picture.

$3 \times 3 = 9$

Discuss that since the number of rows and the number of columns are the same, there is only one multiplication sentence for the picture. Repeat this for two rows of two ($2 \times 2 = 4$).

Written and Other Activities

☐

mathways 3, pages 194, 195

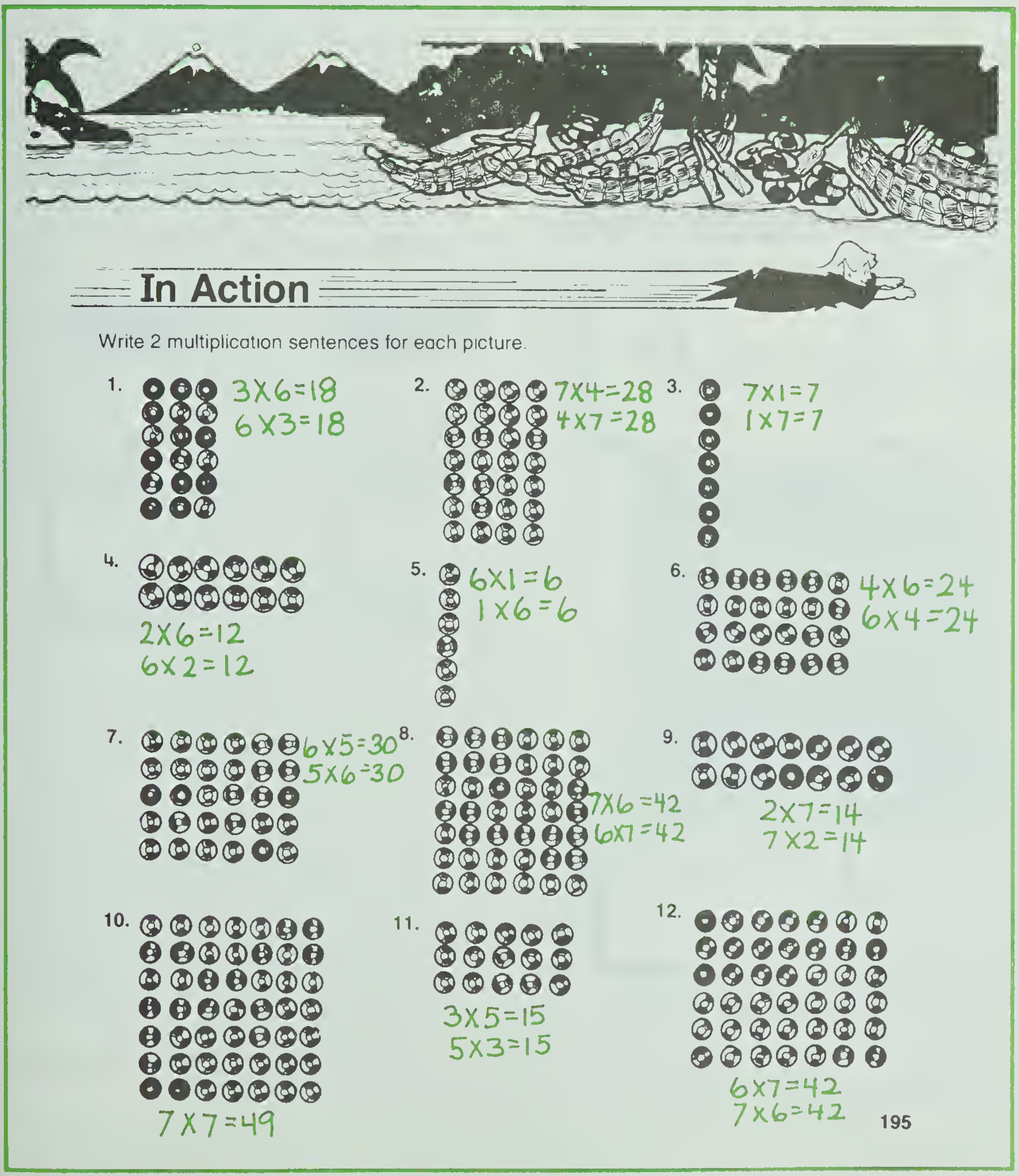
Compare the two sets of six, the six sets of two, the two rows of six, and the six rows of two, noting the multiplication sentence for each. Emphasize that each equals 12. Assign the In Action questions on page 195.

☐ ☐

Draw pictures with the same number of rows and columns; for example, two rows of two, and three rows of three. Have the children write one multiplication sentence for each picture.

☐ ☐ ☐

Have the children draw sets to show the multiplication sentence written for exercises 1 to 4 on pupil page 195. For $7 \times 3 = 21$, they would draw seven sets of three and for $3 \times 7 = 21$, they would draw three sets of seven.



In Action

Write 2 multiplication sentences for each picture.

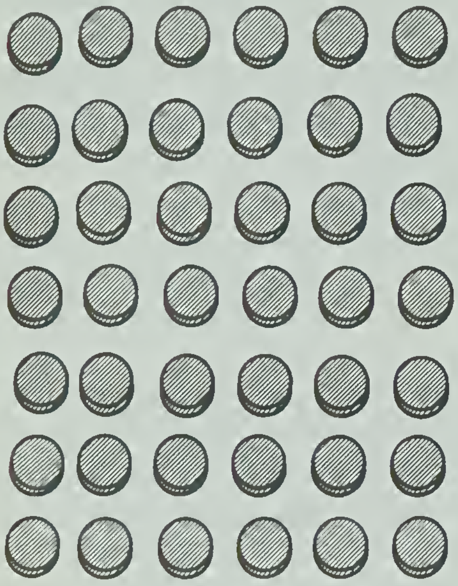
1. 3X6=18 6X3=18
2. 7X4=28 4X7=28
3. 7X1=7 1X7=7
4. 2X6=12 6X2=12
5. 6X1=6 1X6=6
6. 4X6=24 6X4=24
7. 6X5=30 5X6=30
8. 7X6=42 6X7=42
9. 2X7=14 7X2=14
10. 7X7=49
11. 3X5=15 5X3=15
12. 6X7=42 7X6=42

195

Compare these sets with the rows and columns.

□ □ □ □

Show an array of buttons, or other counters, with seven rows and six columns to represent 7 × 6.



Have the students observe that in seven rows and six columns there are 42 buttons. Remove one row and ask for the number in six rows and in six columns. Remove a second row and find the number in five rows and six columns. Continue the pattern to six columns and one row, and then for zero columns. Discuss that for zero columns there are zero rows, and therefore zero buttons.

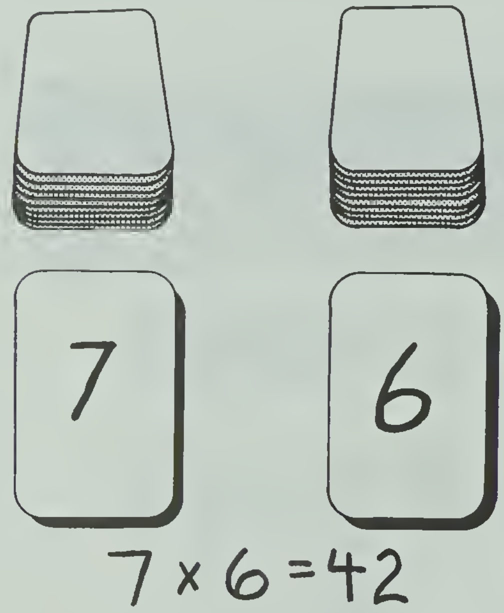
Reverse this activity to demonstrate building an array. Begin with zero rows, build one row of six columns for 1 × 6, then two rows of six columns, and then three rows of six columns. Continue this to seven rows of six columns, having children state the multiplication sentence for each stage.

□ □ □ □ □

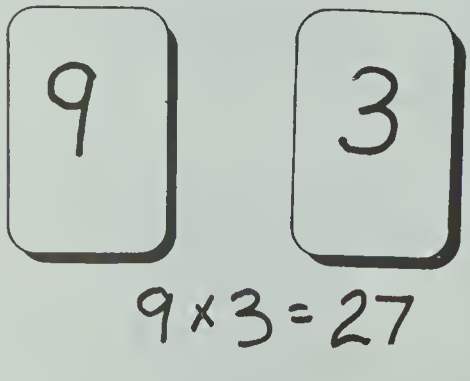
To provide practice multiplying by zero and by one, make two decks of cards. For the first deck write the numerals 0 and 1 alternately on 30 cards. For the other deck, make three cards for each of the numbers from 0 to 9. Turn over one card from each deck and call the number pair. Children respond by recording the product of each number pair.

□ □ □ □ □ □

To reinforce multiplication facts, pair children and have them play this game. Use two decks of cards, each deck comprised of 30 cards, three cards for each of the numerals from 0 to 9. Have each child turn a deck face down. Establish that turns alternate. Choose a first player in any convenient manner. For player A's turn, both players turn over a card, player A says the product, adds the two digits in the product and records that sum as her or his score. For player B's turn, the procedure is repeated. After 10 rounds — five turns each — both players find their total score and a winner is declared. The decks, containing cards for three rounds, are sufficient for a player to win two out of three rounds.



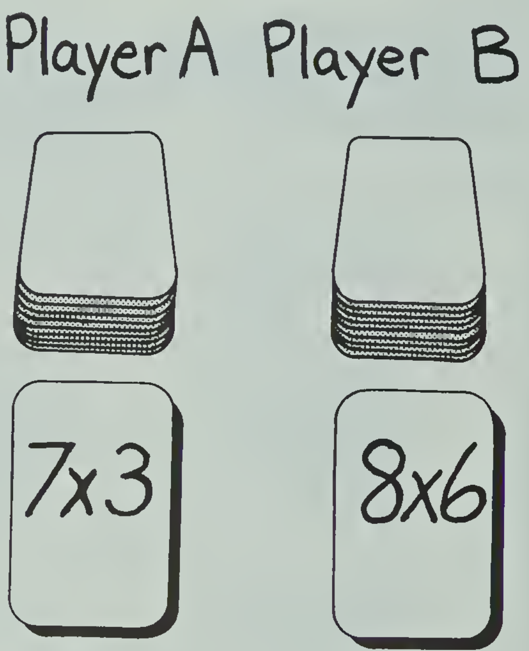
Player A records (4 + 2) points.



Player B records (2 + 7) points.

□ □ □ □ □ □ □

Have the children play *Multiplication War.* Provide each player in a pair with a deck of cards on which multiplication expressions have been recorded. The size of the decks and the complexity of the expressions can vary according to the needs of the children involved. Both children turn over a card and each states the product of the expression on her or his unturned card. The child with the greater product claims both cards and slides them under the deck where they may be played again. The player having the most cards at the end of a specified time period is the winner.



Player B claims both cards.

Unit 3 Section 2 Lesson 5

Exploring Multiplication Facts to 7 × 7

Materials

- for each child
  - blank 100-squares, reproduced from Program Master 21

Lesson

1

Seat the children around the working area. Ask different children for the products of the following:

0 × 3
0 × 5
0 × 1

Invite children to express in their own words the result of multiplying by zero.

2

Repeat the procedure described above for multiplying by one.

3

Challenge the children with several questions such as

What number do you get when you double three?

Relate doubling to multiplying, explaining that doubling three is the same as multiplying two times three.

4

Distribute copies of a blank 100-square. Have the children make multiplication charts by writing the numerals 0 to 7 along the side and across the top as illustrated, without filling in the products.

X	0	1	2	3	4	5	6	7
0								
1								
2								
3								
4								
5								
6								
7								

Have the children complete the charts.

Written and Other Activities

☐

mathways 3, page 196

Discuss the chart shown at the top of the page, and ask children to point out patterns. Finding the patterns helps children to notice and memorize multiplication facts on the chart. Have different children read the examples and explain in their own words the result of multiplying by zero, one and two. Assign the questions.

☐ ☐

For extra practice, alter the customary multiplication chart. Distribute copies and have the children complete this chart.

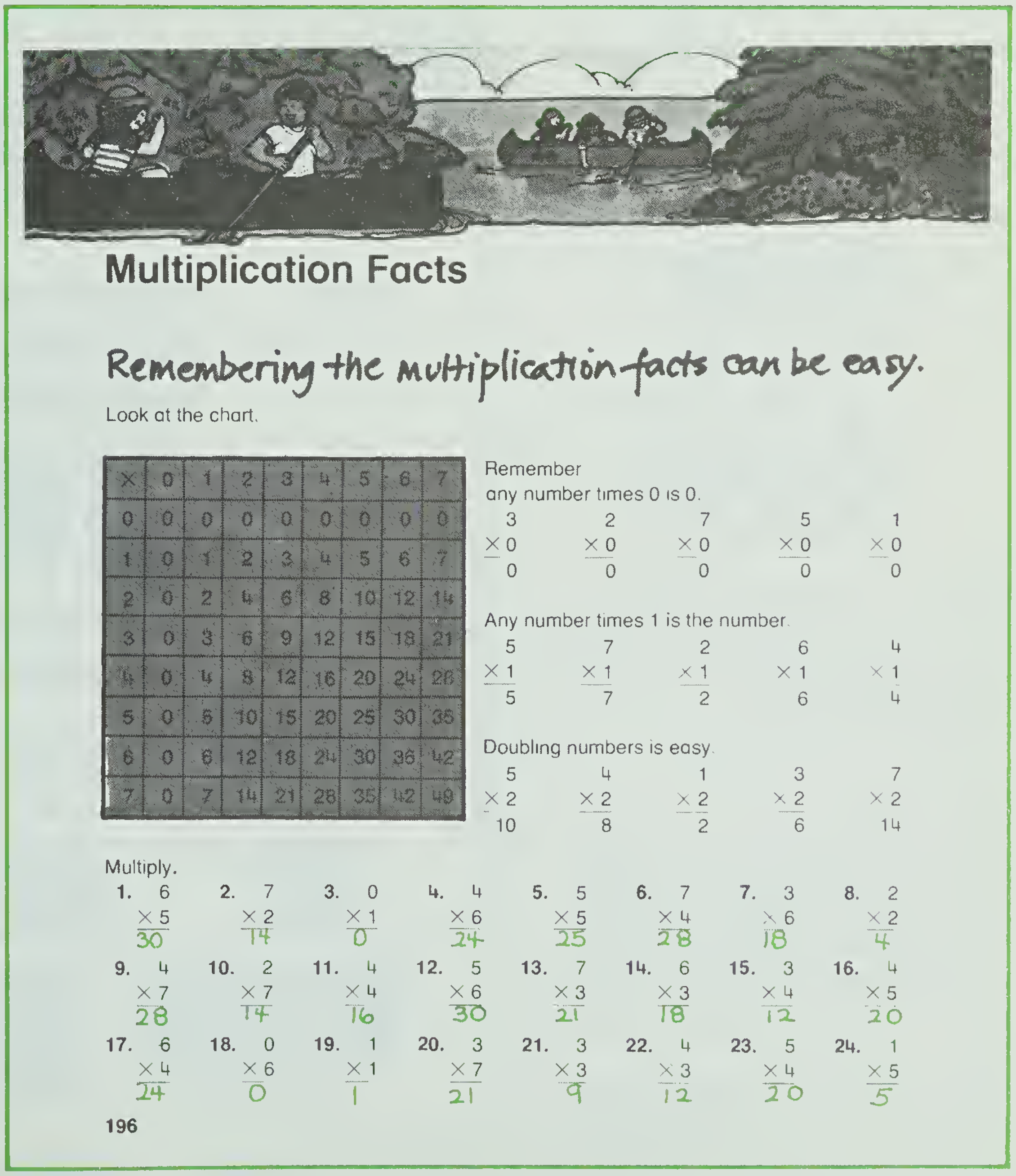
X	3	7	0	1	4	5	2	6
2								
5								
1								
6								
3								
4								
7								
0								

☐ ☐ ☐

mathways 3 Practice Masters page 40

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 60



Multiplication Facts

Remembering the multiplication facts can be easy.

Look at the chart.

×	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7
2	0	2	4	6	8	10	12	14
3	0	3	6	9	12	15	18	21
4	0	4	8	12	16	20	24	28
5	0	5	10	15	20	25	30	35
6	0	6	12	18	24	30	36	42
7	0	7	14	21	28	35	42	49

Remember
any number times 0 is 0.

$\begin{array}{r}3\\ \times 0\\ \hline 0\end{array}$ $\begin{array}{r}2\\ \times 0\\ \hline 0\end{array}$ $\begin{array}{r}7\\ \times 0\\ \hline 0\end{array}$ $\begin{array}{r}5\\ \times 0\\ \hline 0\end{array}$ $\begin{array}{r}1\\ \times 0\\ \hline 0\end{array}$

Any number times 1 is the number.

$\begin{array}{r}5\\ \times 1\\ \hline 5\end{array}$ $\begin{array}{r}7\\ \times 1\\ \hline 7\end{array}$ $\begin{array}{r}2\\ \times 1\\ \hline 2\end{array}$ $\begin{array}{r}6\\ \times 1\\ \hline 6\end{array}$ $\begin{array}{r}4\\ \times 1\\ \hline 4\end{array}$

Doubling numbers is easy.

$\begin{array}{r}5\\ \times 2\\ \hline 10\end{array}$ $\begin{array}{r}4\\ \times 2\\ \hline 8\end{array}$ $\begin{array}{r}1\\ \times 2\\ \hline 2\end{array}$ $\begin{array}{r}3\\ \times 2\\ \hline 6\end{array}$ $\begin{array}{r}7\\ \times 2\\ \hline 14\end{array}$

Multiply.

1. $\begin{array}{r}6\\ \times 5\\ \hline 30\end{array}$ 2. $\begin{array}{r}7\\ \times 2\\ \hline 14\end{array}$ 3. $\begin{array}{r}0\\ \times 1\\ \hline 0\end{array}$ 4. $\begin{array}{r}4\\ \times 6\\ \hline 24\end{array}$ 5. $\begin{array}{r}5\\ \times 5\\ \hline 25\end{array}$ 6. $\begin{array}{r}7\\ \times 4\\ \hline 28\end{array}$ 7. $\begin{array}{r}3\\ \times 6\\ \hline 18\end{array}$ 8. $\begin{array}{r}2\\ \times 2\\ \hline 4\end{array}$

9. $\begin{array}{r}4\\ \times 7\\ \hline 28\end{array}$ 10. $\begin{array}{r}2\\ \times 7\\ \hline 14\end{array}$ 11. $\begin{array}{r}4\\ \times 4\\ \hline 16\end{array}$ 12. $\begin{array}{r}5\\ \times 6\\ \hline 30\end{array}$ 13. $\begin{array}{r}7\\ \times 3\\ \hline 21\end{array}$ 14. $\begin{array}{r}6\\ \times 3\\ \hline 18\end{array}$ 15. $\begin{array}{r}3\\ \times 4\\ \hline 12\end{array}$ 16. $\begin{array}{r}4\\ \times 5\\ \hline 20\end{array}$

17. $\begin{array}{r}6\\ \times 4\\ \hline 24\end{array}$ 18. $\begin{array}{r}0\\ \times 6\\ \hline 0\end{array}$ 19. $\begin{array}{r}1\\ \times 1\\ \hline 1\end{array}$ 20. $\begin{array}{r}3\\ \times 7\\ \hline 21\end{array}$ 21. $\begin{array}{r}3\\ \times 3\\ \hline 9\end{array}$ 22. $\begin{array}{r}4\\ \times 3\\ \hline 12\end{array}$ 23. $\begin{array}{r}5\\ \times 4\\ \hline 20\end{array}$ 24. $\begin{array}{r}1\\ \times 5\\ \hline 5\end{array}$

196

Unit 3 Section 2 Lesson 6

Using Rows and Columns to Represent Division Sentences

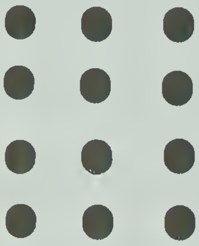
Materials

- counters
- seven pieces of string
- stencil, *see* ☐ ☐ ☐ ☐

Lesson

1

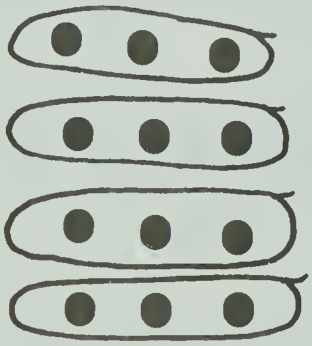
Gather the children around the working area. Place the counters in the centre. Have the children each arrange 12 counters in four rows and three columns.



How many counters are there?
How many columns are there?
How many rows are there?

Write on the easel
12 counters in 3 columns result in 4 rows

Use string to loop the counters in each row.



Ask
How many counters are there?
How many sets of counters are there?
How many counters are in each set?

Record on the easel
12 counters in sets of 3 result in 4 sets.
12 ÷ 3 = 4

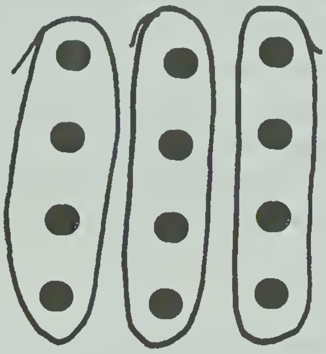
Discuss the statements on the easel, pointing out how rows and columns show division sentences as well as multiplication sentences. Leave the arrays of counters and the statements on the easel intact for the next activity.

2

Have the children arrange another 12 counters in an array with four rows and three columns. Have them tell the number of counters, the number of rows and the number of columns.

Write on the easel
12 counters in 4 rows result in 3 columns

Use string to loop the counters in sets of four.

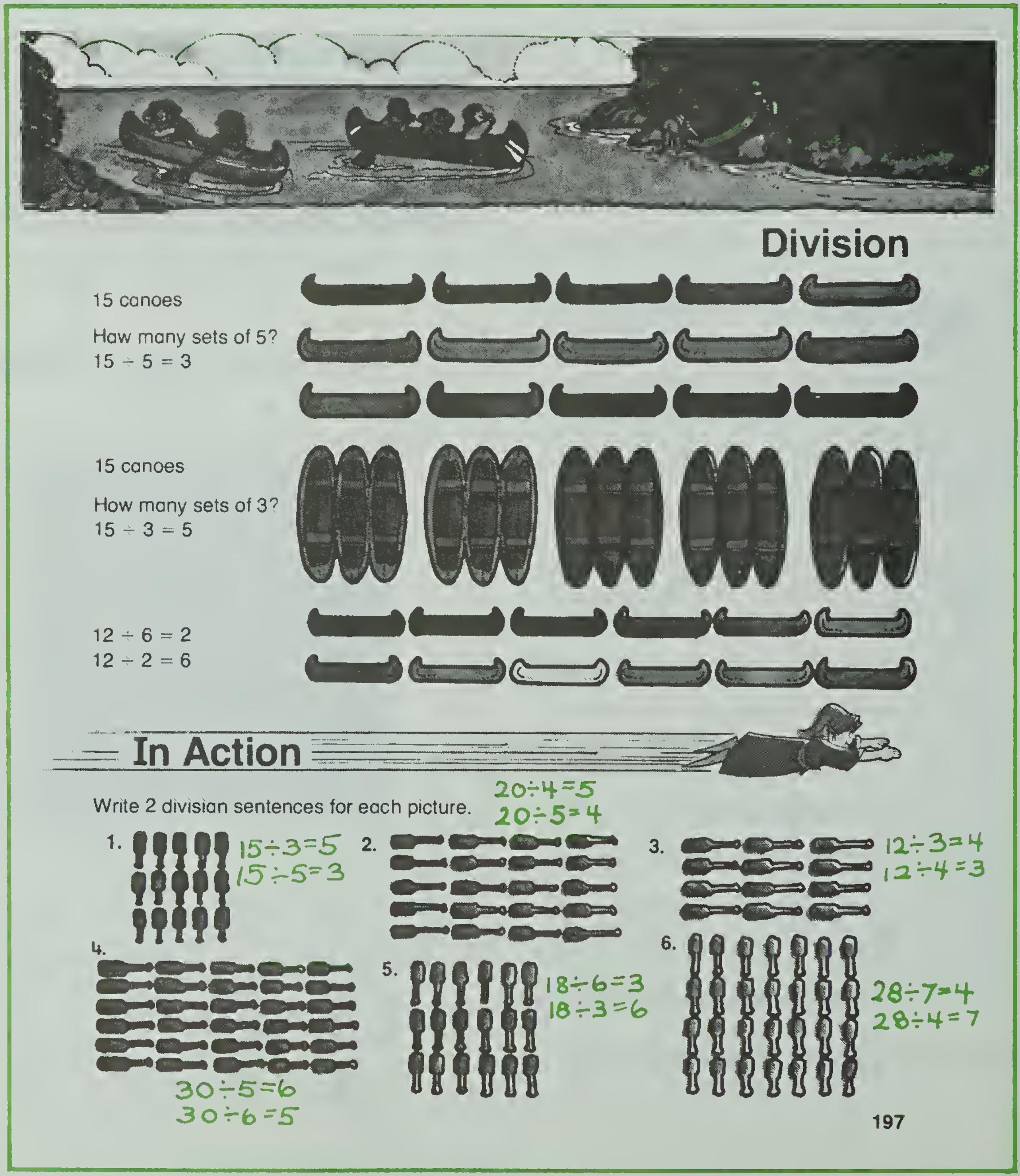


Ask for the number of counters, the number of counters in each set and the number of sets. Record on the easel beside the statements from the previous activity
12 counters in sets of 4 result in 3 sets
12 ÷ 4 = 3

Compare the two arrays of counters and discuss the statements on the easel. Conclude that rows and columns of counters can demonstrate two different division sentences, depending on which way the sets are made.

3

Use the procedure described in activities 1 and 2, using arrays with a different number of rows and columns. Then show arrays with the same number of rows and columns, for example, four rows and four columns, or three rows and three



Division

15 canoes

How many sets of 5?
15 ÷ 5 = 3

15 canoes

How many sets of 3?
15 ÷ 3 = 5

12 ÷ 6 = 2
12 ÷ 2 = 6

In Action

Write 2 division sentences for each picture.

1. 15÷3=5
15÷5=3

2. 20÷4=5
20÷5=4

3. 12÷3=4
12÷4=3

4. 30÷5=6
30÷6=5

5. 18÷6=3
18÷3=6

6. 28÷7=4
28÷4=7

197

columns. Discuss the arrays, concluding that when the number of rows and columns is the same, the array shows only one division sentence.

4

On the easel draw a picture with the same number of rows and columns, for example five rows and five columns. Have a child record a division sentence on the easel for the picture. Then erase one column and have another child record the new division sentence. Discuss the activity. Repeat.

Written and Other Activities

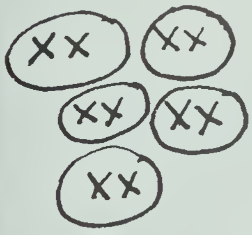
☐

mathways 3, page 197

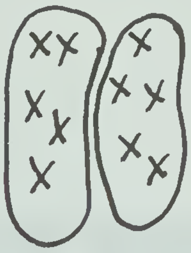
Discuss the examples at the top of the page before assigning the In Action questions.

☐ ☐

Have the children draw sets for each of the division sentences written for questions 1 to 3 on *mathways 3* page 197. For example, for the division sentence $10 \div 2 = 5$, they would draw five sets of two, and for $10 \div 5 = 2$ they would draw two sets of five.



$10 \div 2 = 5$



$10 \div 5 = 2$

Compare these sets with the rows and columns.

☐ ☐ ☐

Have a child show an array with seven rows and seven columns.
Have another child write the division sentence on the easel.

$49 \div 7 = 7$

Remove one row. Have a child write the two division sentences shown.

$42 \div 7 = 6 \quad 42 \div 6 = 7$

Remove another row and call on another child to write the division sentences shown.

$35 \div 5 = 7 \quad 35 \div 7 = 5$

Continue in this manner until there is one row of seven. Then, reverse the procedure, having children add rows one at a time and write the corresponding division sentences.

☐ ☐ ☐ ☐

Record a number of division expressions on a stencil and duplicate a copy for each child. Ask the children to draw and loop Xs to show the meaning of each expression.

$18 \div 3$	$10 \div 5$
$25 \div 5$	$6 \div 6$
$27 \div 9$	$24 \div 6$
$9 \div 9$	$30 \div 6$
$24 \div 8$	$35 \div 7$

☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 41

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Tests 1A, 1B

☐ ☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 61

For Your Notes

Unit 3 Section 2 Lesson 7

Drawing Pictures for Multiplication to 7 × 7

Materials

- for each child
  - counters
  - dot paper reproduced from Program Master 2

Lesson

1

Gather the children around the working area and distribute the counters. Write a multiplication expression on the easel.

6 × 3 =

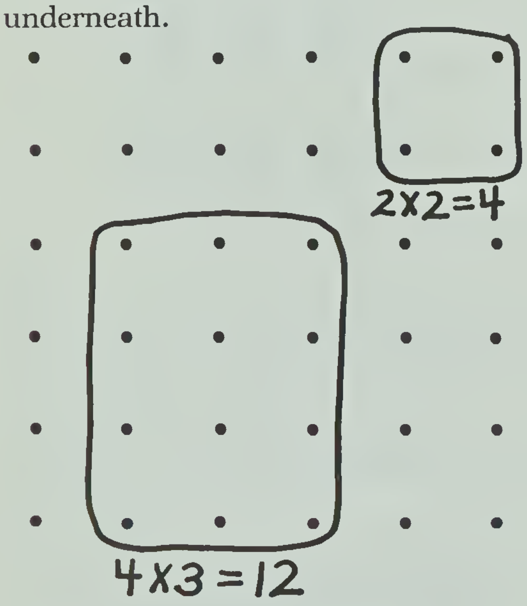
Have each child use the counters to build an array to find the product. Have a child complete the sentence on the easel.

6 × 3 = 18

Repeat several times. Discuss how an array can be used to find the product for multiplication.

2

Distribute the dot paper, one sheet to each child. On a sheet of plain paper, the children write 10 multiplication expressions, such as 4 × 3. Then they loop rows and columns of dots to represent each expression and write the multiplication sentence underneath.



Encourage the children to use multiplication facts they do not already know for this activity.

3

Have the children work in pairs. Each partner arranges counters to show an array from 1 × 1 to 7 × 7. The partners state the multiplication fact shown by the array made by the other. Have the children repeat this phase of the activity several times. Then reverse the instructions. Each partner writes a multiplication expression, then makes an array for the expression written by the other partner, and states the product.

Written and Other Activities

☐

mathways 3, page 198

Have children read the examples shown. Discuss them with the children before assigning the In Action questions.

☐ ☐

As an art lesson, have each child write an expression and draw a picture of an array for the expression. Then the children complete the sentence and write the equivalent sentence beside it, and two division sentences shown by the picture each has drawn.

2 × 5 = 10   5 × 2 = 10
10 ÷ 5 = 2   10 ÷ 2 = 5

Possible subjects for the pictures are boxes of food in a carton, books on shelves, an arrangement of pictures on a wall, flowers in a garden, and bricks in a wall. Display the pictures and use them to initiate a discussion about objects arranged in rows and columns commonly seen in the environment.

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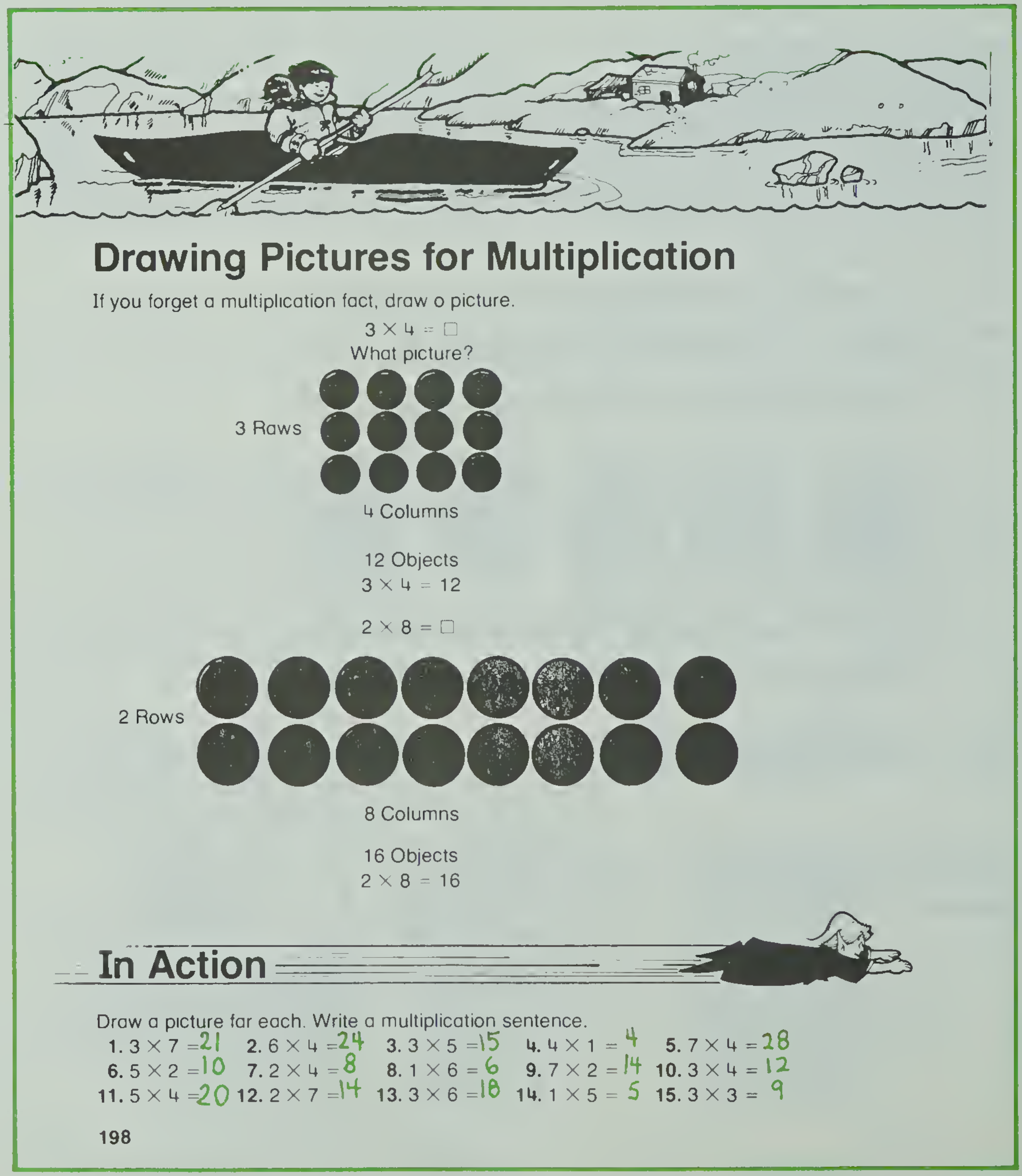
mathways 3 Plus Workbook page 62



Drawing Pictures for Multiplication

If you forget a multiplication fact, draw a picture.

3 × 4 = ☐
What picture?

3 Rows
4 Columns

12 Objects
3 × 4 = 12

2 × 8 = ☐

2 Rows
8 Columns

16 Objects
2 × 8 = 16

In Action

Draw a picture for each. Write a multiplication sentence.

1. 3 × 7 = 21 2. 6 × 4 = 24 3. 3 × 5 = 15 4. 4 × 1 = 4 5. 7 × 4 = 28
6. 5 × 2 = 10 7. 2 × 4 = 8 8. 1 × 6 = 6 9. 7 × 2 = 14 10. 3 × 4 = 12
11. 5 × 4 = 20 12. 2 × 7 = 14 13. 3 × 6 = 18 14. 1 × 5 = 5 15. 3 × 3 = 9

198

Unit 3 Section 2 Lesson 8

Drawing Pictures for Division to 49 ÷ 7

Materials

- for each child
  - counters
  - dot paper, reproduced from Program Master 2

Lesson

1

Gather the children around the working area and distribute the counters. Write a division expression on the easel

24 ÷ 6 =

Have each child arrange 24 counters in rows of six to find the number of columns. Have a child complete the division sentence on the easel

24 ÷ 6 = 4

Repeat several times. Discuss how an array can be used in division.

2

Distribute the dot paper, one sheet to each child. On a sheet of plain paper, the children write 10 division expressions, such as

42 ÷ 7 =

They then loop rows and columns of dots to represent each expression and complete the division sentences.

42 ÷ 7 = 6

The children then write another division sentence shown by the array of dots.

42 ÷ 6 = 7

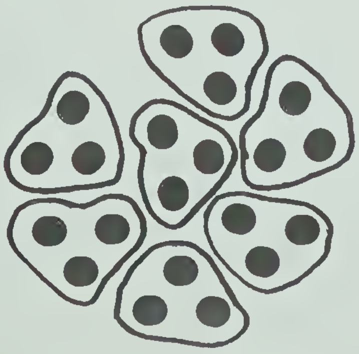
3

Invite a child to write a division expression on the easel.

21 ÷ 3 =

Have each child separate a group of 21 counters into sets of 3.

Have a child complete the division sentence on the easel. Repeat.



21 ÷ 3 = 7

Written and Other Activities

☐

mathways 3, page 199

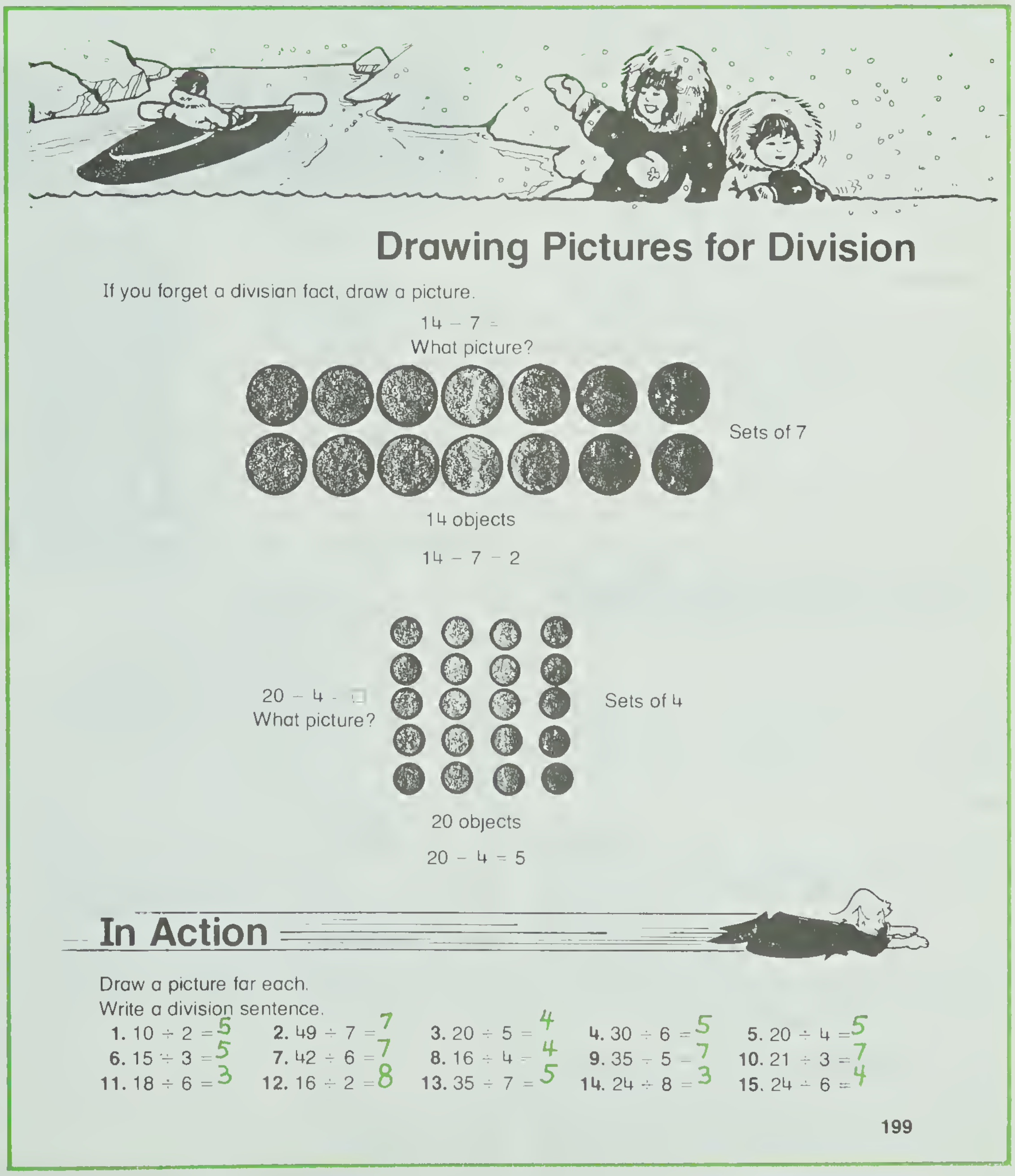
Have children read the examples at the top of the page. Discuss each before assigning the In Action questions.

☐ ☐

Pairs of children use counters to represent a division expression. Each partner states the division sentences shown by the array made by the other partner. After a time, reverse the instructions. Have each partner write a division expression. The children then build arrays to represent the expression written by the other partner, and complete the division sentences.

☐ ☐ ☐

mathways 3 Plus Workbook page 63



Drawing Pictures for Division

If you forget a division fact, draw a picture.

14 ÷ 7 = □

What picture?

14 objects

14 ÷ 7 = 2

20 ÷ 4 = □

What picture?

20 objects

20 ÷ 4 = 5

In Action

Draw a picture for each.

Write a division sentence.

1. 10 ÷ 2 = 5
2. 49 ÷ 7 = 7
3. 20 ÷ 5 = 4
4. 30 ÷ 6 = 5
5. 20 ÷ 4 = 5
6. 15 ÷ 3 = 5
7. 42 ÷ 6 = 7
8. 16 ÷ 4 = 4
9. 35 ÷ 5 = 7
10. 21 ÷ 3 = 7
11. 18 ÷ 6 = 3
12. 16 ÷ 2 = 8
13. 35 ÷ 7 = 5
14. 24 ÷ 8 = 3
15. 24 ÷ 6 = 4

199

Unit 3 Section 3 Lesson 1

Multiplying by Eight to 8 × 9

Materials

- counters
- for each child
  - – dot paper, reproduced from Program Master 2
  - – copy of stencil, as illustrated
- for each group of three or four
  - – die marked 4, 5, 6, 7, 8, 9
- multiplication expression cards, *see* ☐ ☐ ☐ ☐

Rationale

Although multiplying by zero or one is the easiest multiplication to do, it often confuses children. Therefore special emphasis is placed on these factors in this lesson. Making the properties of zero and one explicit will help children to learn the associated multiplication facts:

Zero times any number equals zero.
Any number times zero equals zero.
One times any number equals the number.
Any number times one equals the number.

Lesson

1

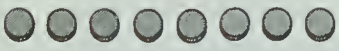
Gather the children around the easel. Write the following expressions:

8 × 0
0 × 8
8 × 1
1 × 8

Discuss multiplying by factors of one and zero and have children complete the expressions on the easel.

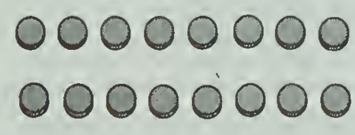
2

Invite a child to draw a row of eight counters on the easel and write two multiplication sentences to represent the drawing.



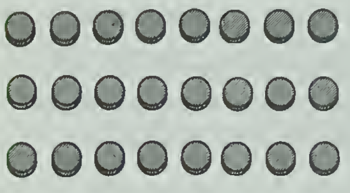
1×8=8
8×1=8

Have another child add one more row of counters and record the equivalent multiplication sentences.



2×8=16
8×2=16

Ask a different child to draw a third row of eight counters and record the equivalent multiplication sentences.



3×8=24
8×3=24

Continue in this manner until there are nine rows and eight columns demonstrating 9 × 8 = 72 and 8 × 9 = 72. For eight rows and eight columns, explain that when the number of rows and columns is the same, the arrangement demonstrates only one multiplication sentence, 8 × 8 = 64.

3

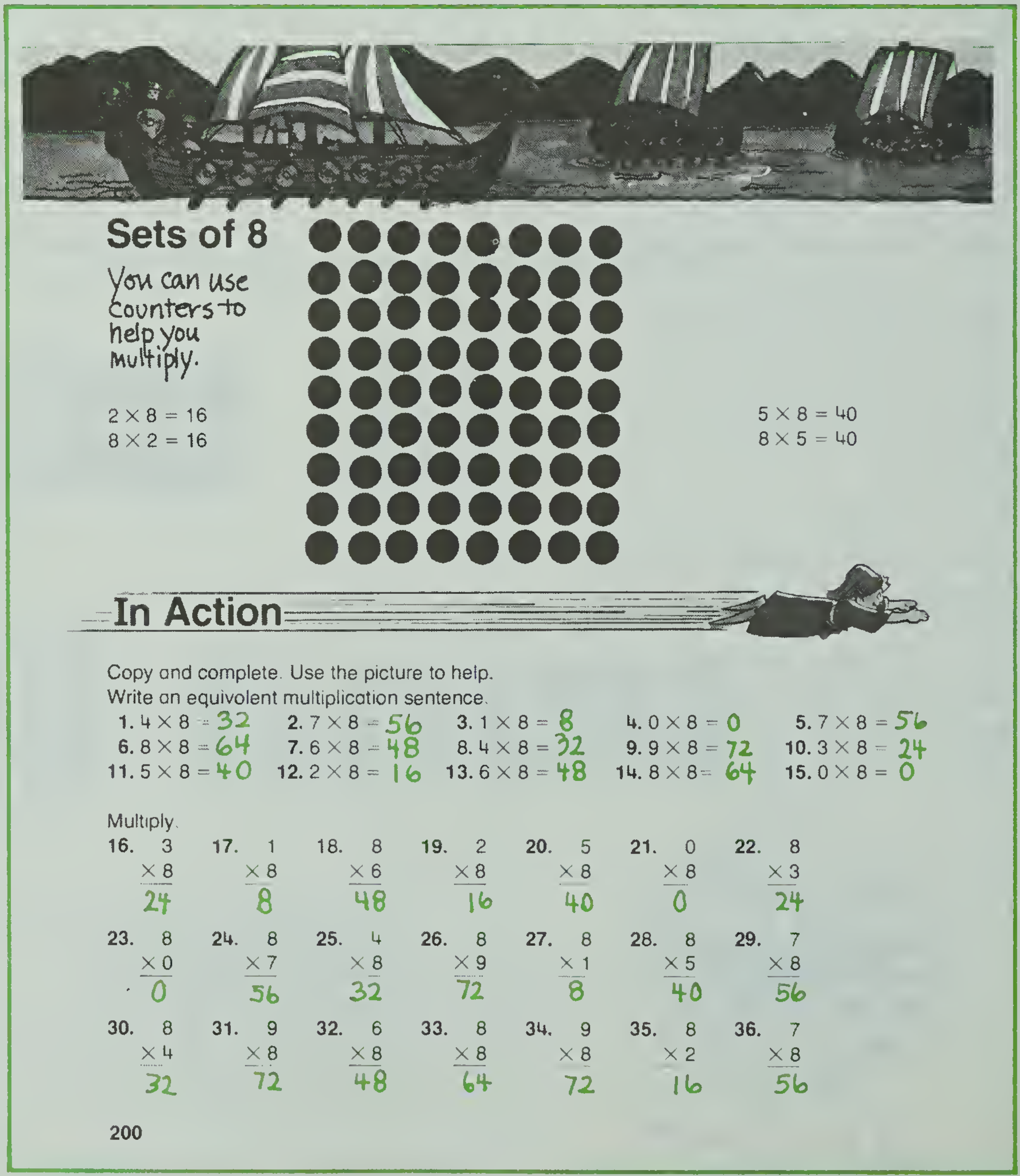
Place counters in the centre of the working area. Write the following missing-factor expressions on the easel:

8 × __ = 0
8 × __ = 8
8 × __ = 32
8 × __ = 48
8 × __ = 72
8 × __ = 64

Have the children use counters to discover the missing factor for each sentence. Have a child write the equivalent multiplication sentence.

4

Distribute dot paper. Have the children loop rows of eight to demonstrate the multiplication facts of eight to 9 × 8, cut out the sections, glue them into their notebooks, and write the



Sets of 8

You can use counters to help you multiply.

2 × 8 = 16
8 × 2 = 16

5 × 8 = 40
8 × 5 = 40

In Action

Copy and complete. Use the picture to help.
Write an equivalent multiplication sentence.

1. 4 × 8 = 32
2. 7 × 8 = 56
3. 1 × 8 = 8
4. 0 × 8 = 0
5. 7 × 8 = 56
6. 8 × 8 = 64
7. 6 × 8 = 48
8. 4 × 8 = 32
9. 9 × 8 = 72
10. 3 × 8 = 24
11. 5 × 8 = 40
12. 2 × 8 = 16
13. 6 × 8 = 48
14. 8 × 8 = 64
15. 0 × 8 = 0

Multiply.

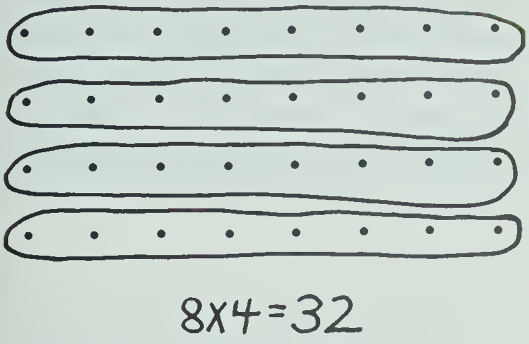
16. $\begin{array}{r}3\\ \times 8\\ \hline 24\end{array}$ 17. $\begin{array}{r}1\\ \times 8\\ \hline 8\end{array}$ 18. $\begin{array}{r}8\\ \times 6\\ \hline 48\end{array}$ 19. $\begin{array}{r}2\\ \times 8\\ \hline 16\end{array}$ 20. $\begin{array}{r}5\\ \times 8\\ \hline 40\end{array}$ 21. $\begin{array}{r}0\\ \times 8\\ \hline 0\end{array}$ 22. $\begin{array}{r}8\\ \times 3\\ \hline 24\end{array}$

23. $\begin{array}{r}8\\ \times 0\\ \hline 0\end{array}$ 24. $\begin{array}{r}8\\ \times 7\\ \hline 56\end{array}$ 25. $\begin{array}{r}4\\ \times 8\\ \hline 32\end{array}$ 26. $\begin{array}{r}8\\ \times 9\\ \hline 72\end{array}$ 27. $\begin{array}{r}8\\ \times 1\\ \hline 8\end{array}$ 28. $\begin{array}{r}8\\ \times 5\\ \hline 40\end{array}$ 29. $\begin{array}{r}7\\ \times 8\\ \hline 56\end{array}$

30. $\begin{array}{r}8\\ \times 4\\ \hline 32\end{array}$ 31. $\begin{array}{r}9\\ \times 8\\ \hline 72\end{array}$ 32. $\begin{array}{r}6\\ \times 8\\ \hline 48\end{array}$ 33. $\begin{array}{r}8\\ \times 8\\ \hline 64\end{array}$ 34. $\begin{array}{r}9\\ \times 8\\ \hline 72\end{array}$ 35. $\begin{array}{r}8\\ \times 2\\ \hline 16\end{array}$ 36. $\begin{array}{r}7\\ \times 8\\ \hline 56\end{array}$

200

corresponding sentences beneath each.



5

Have the children write multiplication expressions for 8 and use repeated addition to complete them as shown on the right.

0×8		0×8=0
8×0	0+0+0+0+0+0+0+0=0	8×0 = 0
1×8	8=8	1×8 = 8
8×1	1+1+1+1+1+1+1+1 = 8	8×1 = 8
2×8	8+8=16	2×8=16
8×2	2+2+2+2+2+2+2+2=16	8×2=16
3×8	8+8+8=24	3×8=24
8×3	3+3+3+3+3+3+3+3=24	8×3=24

Written and Other Activities

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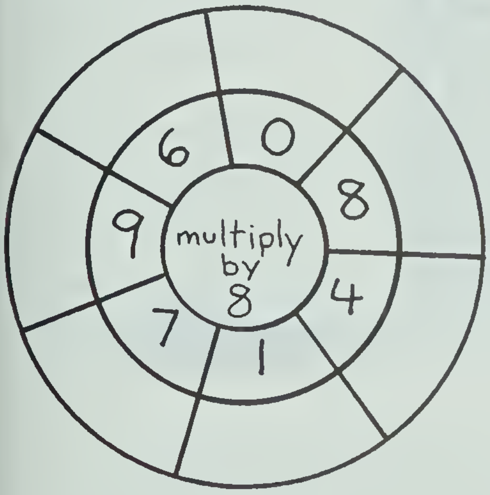
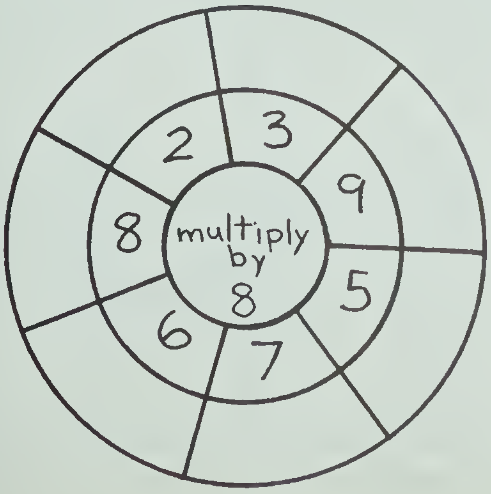
mathways 3, page 200

Discuss the example before assigning the In Action questions.

☐ ☐

Distribute copies of a stencil with the following exercises:



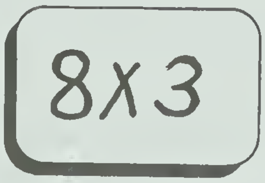


☐ ☐ ☐

For each group of three or four children, mark a die 4, 5, 6, 7, 8, 9. The children take turns tossing the die and multiplying the number shown by 8.

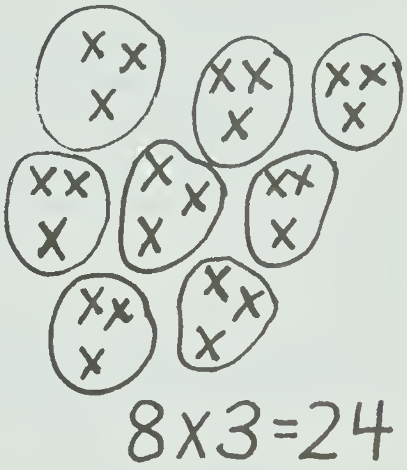
☐ ☐ ☐ ☐

Record the multiplication expressions from 8 × 0 to 8 × 9 on cards, one to a card. Place the shuffled cards in the centre of a group of children. One child turns over a card and tells the group the expression and the product as well as explaining the multiplication sentence. For example:



Eight times three is twenty-four.
Eight equal sets of three counters make twenty-four counters.

All of the children draw an equal sets illustration for 8 × 3 = 24 and record the sentence under their illustration.



A second student then turns over a card and the procedure is repeated.

Unit 3 Section 3 Lesson 2

Multiplying by 9 to 9 × 9

Materials

- counters
- display-size multiplication chart, as illustrated
- tape recorder and earphones (optional)
- for each child
  - dot paper, reproduced from Program Master 2

Rationale

If the children are made aware of methods that can be used to find products they do not know, they develop a better understanding of multiplication and can complete multiplication sentences even when they have forgotten the products. Three different methods that the children should experience are:

Making sets of counters
Making rows and columns of counters
Repeated addition

Some children may prefer one of these methods over the others, and may even use one method exclusively.

The method chosen by other children may depend upon the multiplication fact being sought.

Lesson

1

Gather the children around the easel and write

9 × 0
0 × 9
9 × 1
1 × 9

Discuss multiplying by factors of one and zero, and have the children complete the sentences. Leave these sentences on the easel.

2

Referring to the expression on the easel, elicit from the children that 9 × 1 means nine sets of one or 9 ones added together. Have a child come to the easel and add 9 ones. Compare the sum with the product recorded for 9 × 1. Then discuss the meaning of 1 × 9, emphasizing one set of nine and 1 nine, and again comparing the sum 9 with the product recorded for 9 × 1.

3

Write a multiplication expression on the easel. Discuss how to use repeated addition to find the product for the expression. For example, to find the product for 9 × 2, the children can add nine 2s together as follows:

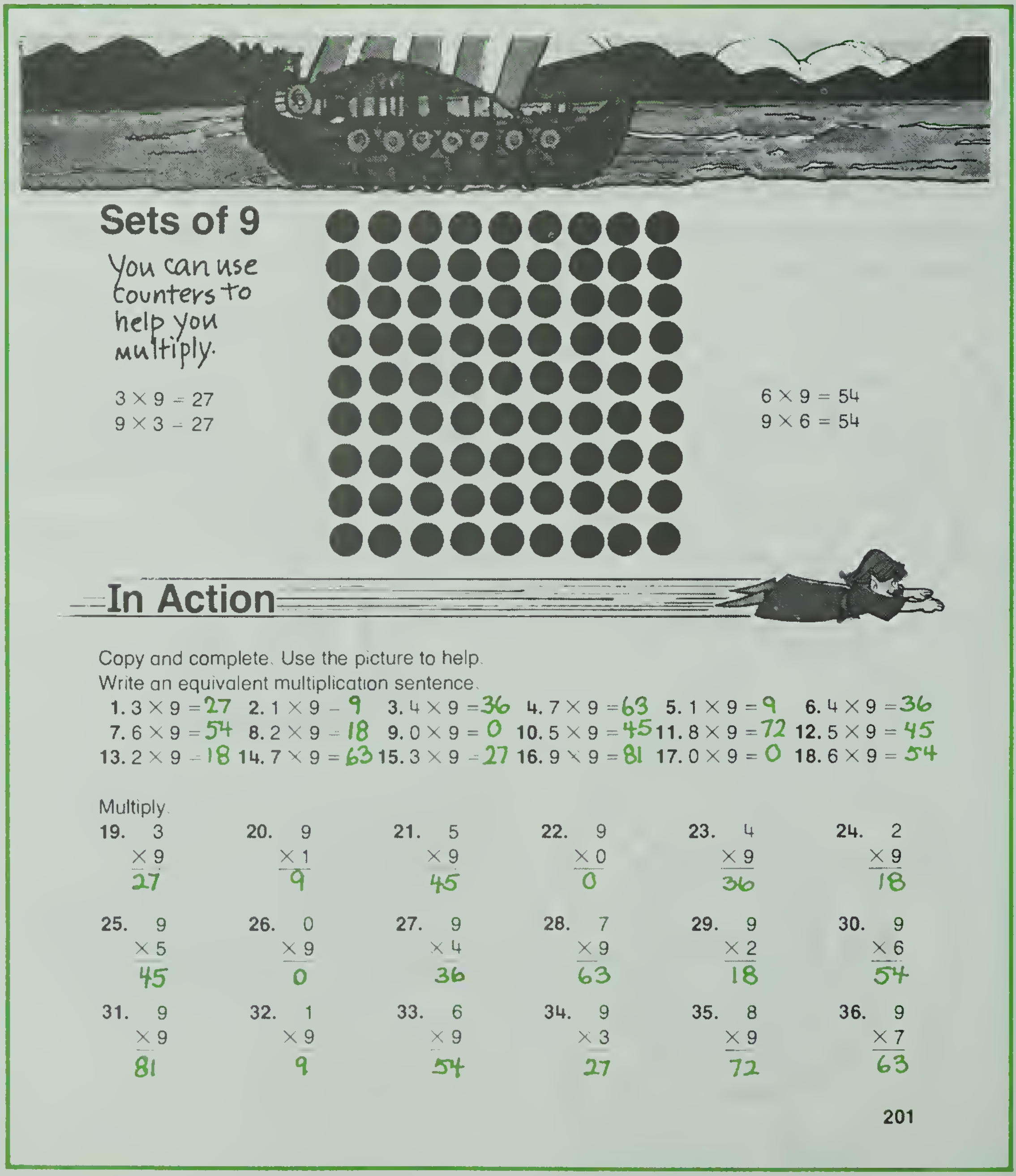
2 plus 2 equals 4 plus 2 equals 6 plus 2 equals 8, . . . , plus 2 equals 18

9×2	2+2+2+2+2+2+2+2+2 = 18	9×2 = 18
2×9	9+9 = 18	2×9 = 18
9×3	3+3+3+3+3+3+3+3+3 = 27	9×3 = 27
3×9	9+9+9 = 27	3×9 = 27
9×4	4+4+4+4+4+4+4+4+4 = 36	9×4 = 36
4×9	9+9+9+9 = 36	4×9 = 36
⋮	⋮	⋮
9×9	9+9+9+9+9+9+9+9+9 = 81	9×9 = 81

Alternatively, they can add two 9s:

9 plus 9 equals 18

When the children appear to be comfortable with the ideas presented, write all the expressions for 9 on the easel, and have the children use repeated addition to complete them, as shown on the left.



Sets of 9

You can use counters to help you multiply.

3 × 9 = 27
9 × 3 = 27

6 × 9 = 54
9 × 6 = 54

In Action

Copy and complete. Use the picture to help.
Write an equivalent multiplication sentence.

1. 3 × 9 = 27
2. 1 × 9 = 9
3. 4 × 9 = 36
4. 7 × 9 = 63
5. 1 × 9 = 9
6. 4 × 9 = 36
7. 6 × 9 = 54
8. 2 × 9 = 18
9. 0 × 9 = 0
10. 5 × 9 = 45
11. 8 × 9 = 72
12. 5 × 9 = 45
13. 2 × 9 = 18
14. 7 × 9 = 63
15. 3 × 9 = 27
16. 9 × 9 = 81
17. 0 × 9 = 0
18. 6 × 9 = 54

Multiply.

19. $\begin{array}{r}3\\ \times 9\\ \hline 27\end{array}$
20. $\begin{array}{r}9\\ \times 1\\ \hline 9\end{array}$
21. $\begin{array}{r}5\\ \times 9\\ \hline 45\end{array}$
22. $\begin{array}{r}9\\ \times 0\\ \hline 0\end{array}$
23. $\begin{array}{r}4\\ \times 9\\ \hline 36\end{array}$
24. $\begin{array}{r}2\\ \times 9\\ \hline 18\end{array}$
25. $\begin{array}{r}9\\ \times 5\\ \hline 45\end{array}$
26. $\begin{array}{r}0\\ \times 9\\ \hline 0\end{array}$
27. $\begin{array}{r}9\\ \times 4\\ \hline 36\end{array}$
28. $\begin{array}{r}7\\ \times 9\\ \hline 63\end{array}$
29. $\begin{array}{r}9\\ \times 2\\ \hline 18\end{array}$
30. $\begin{array}{r}9\\ \times 6\\ \hline 54\end{array}$
31. $\begin{array}{r}9\\ \times 9\\ \hline 81\end{array}$
32. $\begin{array}{r}1\\ \times 9\\ \hline 9\end{array}$
33. $\begin{array}{r}6\\ \times 9\\ \hline 54\end{array}$
34. $\begin{array}{r}9\\ \times 3\\ \hline 27\end{array}$
35. $\begin{array}{r}8\\ \times 9\\ \hline 72\end{array}$
36. $\begin{array}{r}9\\ \times 7\\ \hline 63\end{array}$

4

Distribute dot paper and have the children loop sets of dots to illustrate each of the multiplication expressions for 9. Have them cut out the dot sets, glue them into their notebooks and write the corresponding multiplication sentences beside each.

5

Have one child in a group arrange counters in rows and columns to illustrate a secret multiplication expression for 9. The first group member to correctly state the multiplication sentence, builds the next array of counters for the other group members to identify. Continue the activity until each child has illustrated one expression for 9.

Written and Other Activities

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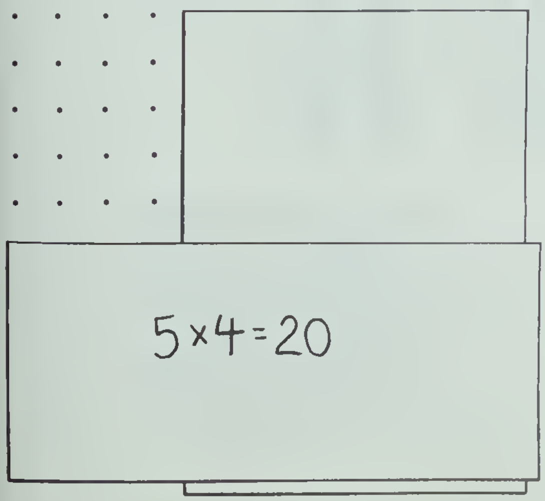
mathways 3, page 201

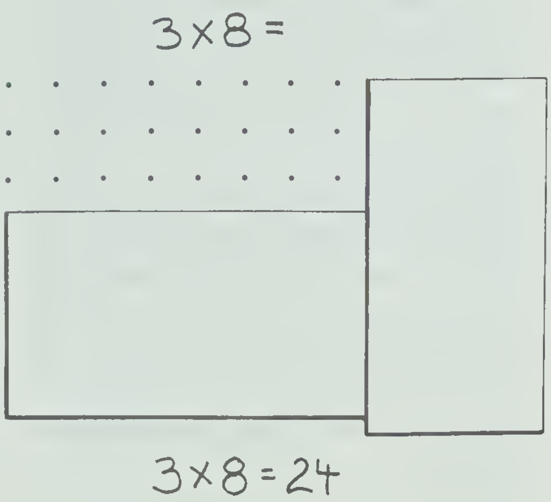
Discuss the example shown before assigning the In Action questions. Have the children use counters or draw arrays to discover products they can't remember.

☐ ☐

Have pairs of children make a nine by nine array. One partner uses two sheets of paper to cover some of the rows to the right and some of the columns at the bottom to show a multiplication fact, and the other partner states the fact.



After a number of rounds, the children reverse the procedure. One child states a multiplication expression and the other child covers part of the array to illustrate, then states the product.



☐ ☐ ☐

A large wall multiplication chart showing only the factors is valuable for drills.

X	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

You may want to temporarily convert the 100-chart to a multiplication chart by using a new set of tags. Due to space limitations, if you include 0 and 1, you will not be able to include 9.

For drill, point to a space on the chart and name a child. The child consults the factors at the beginning of the row and column and states the product. Move the drill as quickly as possible.

☐ ☐ ☐ ☐

If a tape recorder is available, tape 10 multiplication expressions for multiplication facts to 9 × 9, pausing between expressions. Then tape the same expressions again, this time with the products. The children use earphones to listen to the tape and write the products for the expressions. To check their work, they continue listening until all of the multiplication sentences have been heard.

☐ ☐ ☐ ☐ ☐

Tape several sets of 10 multiplication expressions and sentences in the manner described in the previous activity. The volume can be adjusted so that the tape can be used for practice by the entire class or by a small group of children in a quiet corner of the room. Writing the products for the same multiplication expressions helps the children to memorize the products.

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 42

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mathways 3 Plus Workbook page 64

Unit 3 Section 3 Lesson 3

Dividing by Eight

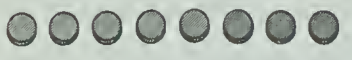
Materials

- die marked 0, 8, 16, 32, 32, 40
- die marked 32, 40, 48, 56, 64, 72
- for each child
  - dot paper reproduced from Program Master 2

Lesson

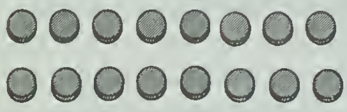
1

Gather the children around the easel. Have the children each make one row of eight counters. Ask a child to record two division sentences for the picture.



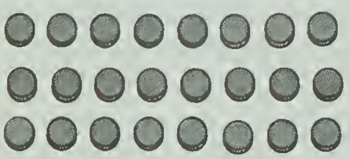
8÷8=1
8÷1=8

Have the children add one more row of eight counters and record two division sentences for the new picture.



16÷8=2
16÷2=8

Have the children add another row and write the corresponding division sentences.



24÷8=3
24÷3=8

Continue in this fashion until there are nine rows and eight columns illustrating 72 ÷ 8 = 9 and 72 ÷ 9 = 8. When there are eight rows and eight columns, discuss with the children why only one division sentence, 64 ÷ 8 = 8, can be written.

2

Distribute dot paper and have the children cut out the appropriate number of rows and columns to illustrate each division expression to 72 ÷ 8, glue the sections of dot paper into their notebooks and write the corresponding division sentences beside each.

3

With the children gathered round, toss the die marked 0, 8, 16, 24, 32, 40. Ask a child to state two division sentences for the number on the die divided and the number eight. Have that child toss the die and name another child to give the corresponding division sentences. After several rounds, switch the die for the one marked 32, 40, 48, 56, 64, 72. Continue the activity until each child has had an opportunity to toss the die and state two division sentences, and most of the division facts of eight have been reviewed.

4

Write a pair of division sentences on the easel.

56 ÷ 8 = 7 *56 ÷ 7 = 8*

Have a child write equivalent multiplication sentences.

7 × 8 = 56 *8 × 7 = 56*

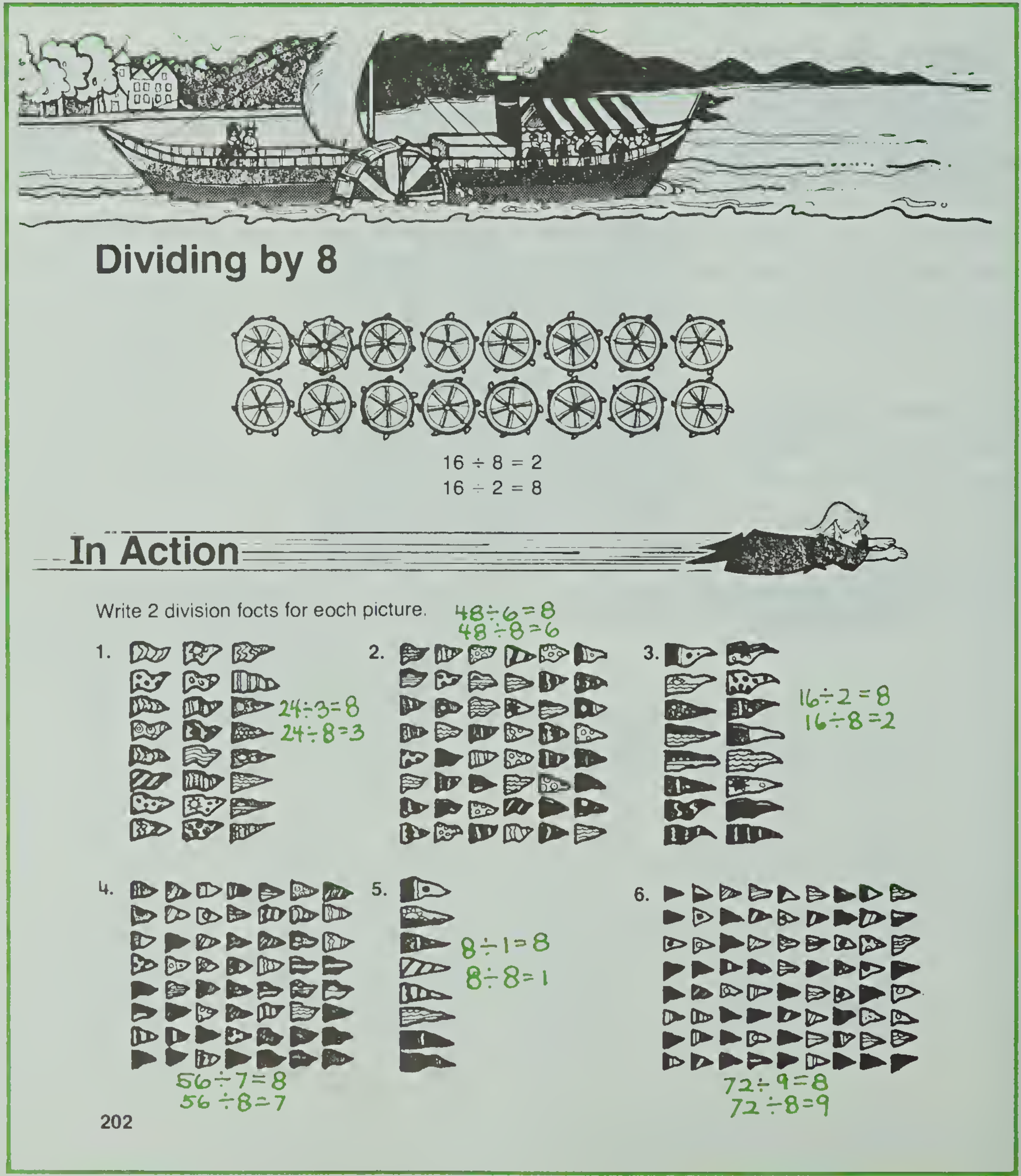
Continue until all the division and multiplication facts of eight have been reviewed.

Written and Other Activities

☐

mathways 3, page 202

Compare the pictures with the array drawn for the lesson. Have children suggest what other objects can be arranged in rows and columns to illustrate division sentences.



Dividing by 8

16 ÷ 8 = 2
16 ÷ 2 = 8

In Action

Write 2 division facts for each picture.

1. 24÷3=8
24÷8=3

2. 48÷6=8
48÷8=6

3. 16÷2=8
16÷8=2

4. 56÷7=8
56÷8=7

5. 8÷1=8
8÷8=1

6. 72÷9=8
72÷8=9

202

Unit 3 Section 3 Lesson 4

Dividing by Nine

Materials

- for each child
  - counters
  - dot paper
- for pairs of children
  - die marked 0, 9, 18, 27, 36, 36
  - die marked 45, 54, 63, 72, 81, 81

Lesson

1

Gather the children around the working area. Have the children each make an array with nine rows and nine columns. Ask a child to record a division fact for the array on the easel. Discuss why equal numbers of rows and columns can illustrate only one division sentence, 81 ÷ 9 = 9.

Have the children remove one row, leaving eight rows and 9 columns. Have a different child write the corresponding division sentences on the easel.

72 ÷ 8 = 9 72 ÷ 9 = 8

Continue removing rows and having children write the division sentences until only one row of nine remains, illustrating 9 ÷ 1 = 9 and 9 ÷ 9 = 1.

2

Challenge the children with a problem.

Twenty-seven ice cream cones were divided equally among nine children. How many ice cream cones did each child receive?

As you talk, write the expression on the easel.

27 ÷ 9 =

Have a child come to the easel and draw an array of ice cream cones to illustrate the expression, then complete the sentence.

27 ÷ 9 = 3

Then say

This time 27 ice cream cones were divided equally among three children. Who can write the division sentence that tells how many ice cream cones each child received?

Have a volunteer write the sentence beneath the first.

27 ÷ 3 = 9

Ask

Must we change the rows and columns of ice cream cones in the array to show 27 ÷ 3 = 9? Why not?

If the children seem interested, continue making up story problems in this fashion, and invite children to make them up.

3

Distribute dot paper. Have the children cut out the appropriate number of rows and columns to illustrate each division expression to 81 ÷ 9, cut out the sections, glue them into their notebooks and label each with the corresponding sentences.

Written and Other Activities

☐

mathways 3, page 203

☐ ☐

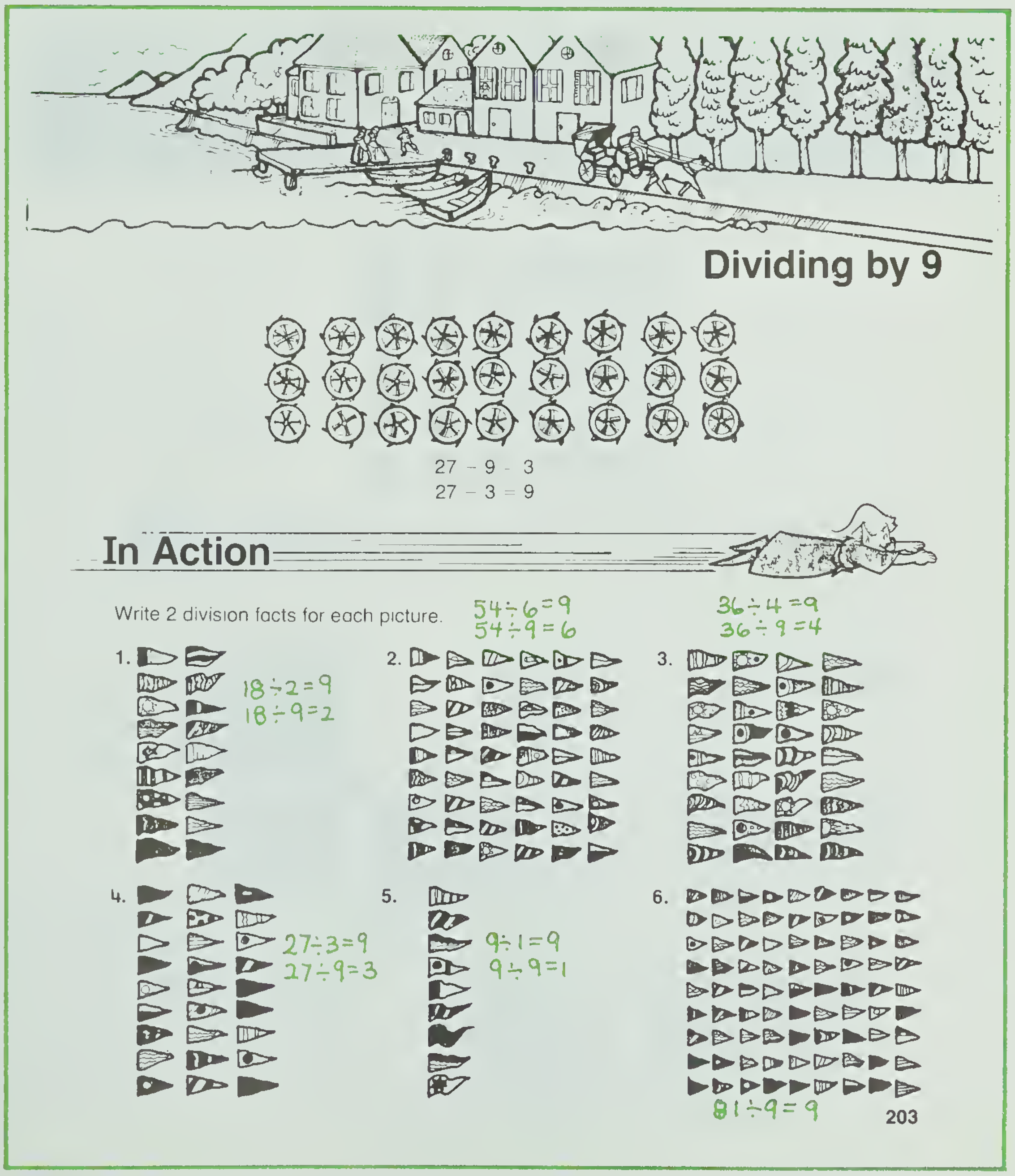
Pairs of children can take turns rolling the die marked 0, 9, 18, 27, 36, 36. One partner rolls the die and the other states the division sentence for the number on the die divided by 9. If the sentence is correct the other partner rolls the die. If not, the first child continues to roll the die. After several rounds, they switch the die for the one marked 45, 54, 63, 72, 81, 81.

☐ ☐ ☐

mathways 3 Practice Masters page 43

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 65



Dividing by 9

27 ÷ 9 = 3
27 ÷ 3 = 9

In Action

Write 2 division facts for each picture.

1. 18÷2=9
18÷9=2

2. 54÷6=9
54÷9=6

3. 36÷4=9
36÷9=4

4. 27÷3=9
27÷9=3

5. 9÷1=9
9÷9=1

6. 81÷9=9

203

Unit 3 Section 3 Lesson 5

Reviewing Multiplication and Division Facts: Making Arrays, Mental Arithmetic

Materials

- counters
- for each child
  - dot paper reproduced from Program Master 2
- for each group
  - dice, both marked 4 to 9
  - graph paper reproduced from Program Master 6

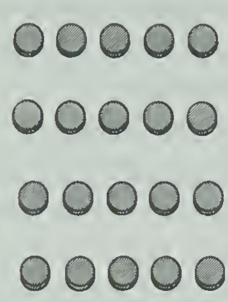
Lesson

1

Gather the children around the working area. Place the counters in the centre. Give a series of instructions such as the following:

Mary, build an array that has five columns and four rows.

Have all of the children write two multiplication and two division facts for the array on the easel.



5×4=20
4×5=20
20÷4=5
20÷5=4

Continue having children build arrays and writing facts, and reviewing many facts to 9 × 9 and 81 ÷ 9.

2

Tell the children that you are going to help them sharpen their mental arithmetic skills. Call out a sequence.

23, add 42, multiply by 3, add 57, multiply by zero, add 8, add 9, subtract 2.

Ask the children for the answer.

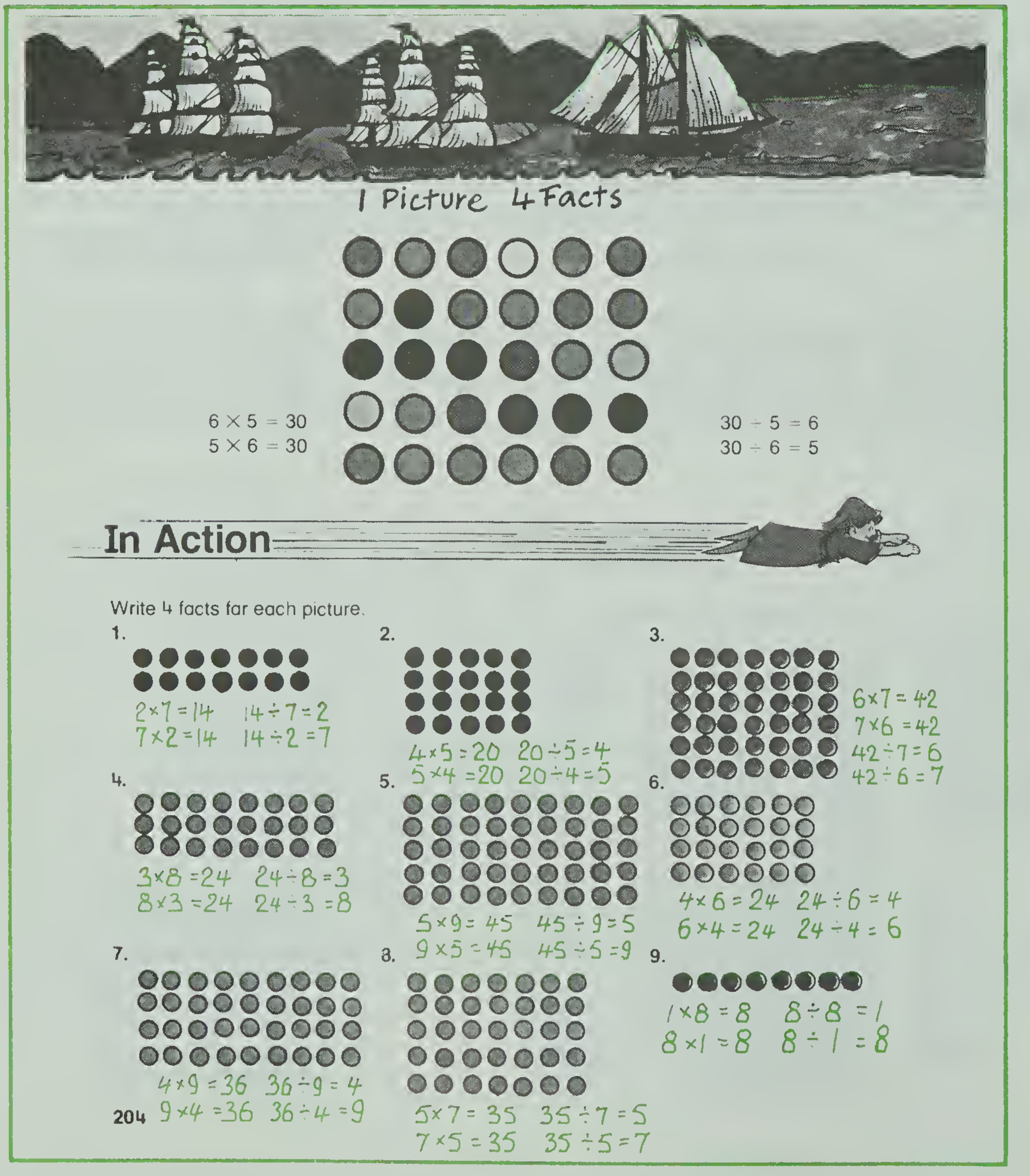
If no child can give 15 as the answer, tell the group to listen carefully and give a second sequence.

89, add 32, subtract 54, add 102, multiply by zero, add 7, multiply by 3, subtract 1.

Usually one or two children will catch on immediately and begin to listen for the instruction *Multiply by zero* before starting to calculate. Of course the operations required after *Multiply by zero* must be within range of what the children can easily handle.

3

Distribute dot paper. Have the children make arrays of rows and columns and write two multiplication and two division facts or, if the number of rows and columns is the same, one multiplication and one division fact. One sheet of dot paper can be used to build several arrays which review many facts.



I Picture 4 Facts

6 × 5 = 30
5 × 6 = 30

30 ÷ 5 = 6
30 ÷ 6 = 5

In Action

Write 4 facts for each picture.

1. 2×7=14 14÷7=2
7×2=14 14÷2=7

2. 4×5=20 20÷5=4
5×4=20 20÷4=5

3. 6×7=42
7×6=42
42÷7=6
42÷6=7

4. 3×8=24 24÷8=3
8×3=24 24÷3=8

5. 5×9=45 45÷9=5
9×5=45 45÷5=9

6. 4×6=24 24÷6=4
6×4=24 24÷4=6

7. 4×9=36 36÷9=4
9×4=36 36÷4=9

8. 5×7=35 35÷7=5
7×5=35 35÷5=7

9. 1×8=8 8÷8=1
8×1=8 8÷1=8

204

Written and Other Activities

☐

mathways 3, page 204

☐ ☐

To reinforce multiplication facts, have small groups of children play *Mult-0*. Each player prepares a grid on graph paper as shown.

X	4	5	6	7	8	9
4						
5						
6						
7						
8						
9						

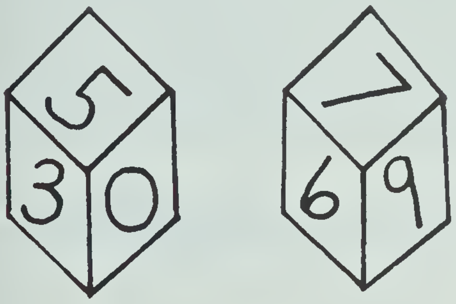
Provide dice, each die marked 4 to 9. Taking turns, the players roll the dice, call out the product and write it in the appropriate square on the grid. The first player to complete a row, column or diagonal calls out *Mult-O*. Players who have already completed both products indicated by the dice may roll once more.

□ □ □

You may wish to send home a letter to keep parents informed of what is happening in the mathematics class. The following may serve as a model.

Dear Parent or Guardian;

It's "fact" time again. This time we are learning multiplication and division facts. Grade threes should know the multiplication facts to 9 × 9 = 81 and the division facts to 81 ÷ 9 = 9. Because there are quite a few to learn, you can be most helpful. Here are a couple of activities to try. Make sugar cube dice by covering the cubes with masking tape. Record the numerals 0, 1, 2, 3, 4 and 5 on one die and 5, 6, 7, 8, and 9 on another die. Roll the dice and have your child say the two multiplication facts from the two numerals on the upturned faces.



$5 \times 7 = 35$

$7 \times 5 = 35$

Then ask for the two division facts which belong in the same fact "family".

35 ÷ 7 = 5

35 ÷ 5 = 7

You might try saying a multiplication or division fact and asking your child to draw you a picture of the fact. It is important that children be able to do this.

Try drawing a picture and asking your child to use it to write four facts. If you look at **mathways 3** *page 204 you will see how this is done. Several short fun-filled sessions learning the "facts" should be very beneficial to your child — and to me! Thanks very much.*

□ □ □ □

mathways 3 Practice Masters pages 44 and 45

For Your Notes

Unit 3 Section 3 Lesson 6

Reading Charts, Solving Word Problems

Materials

- two dice each marked 1 to 6

Lesson

1

Gather the children around the working area and write on the easel

Win	*3 points*
Tie	*2 points*
Lose	*1 point*

Explain that these are the points awarded for games in a tournament. Ask

How many points would you score for winning one game?

How many points would you score for winning one game and losing two games?

In what ways could you score three points?

How could you score four points?

Written and Other Activities

☐

mathways 3, page 205

Compare the scoring system given on the page to the one on the easel. Discuss the chart showing the outcome of the races before assigning the In Action questions.

☐ ☐

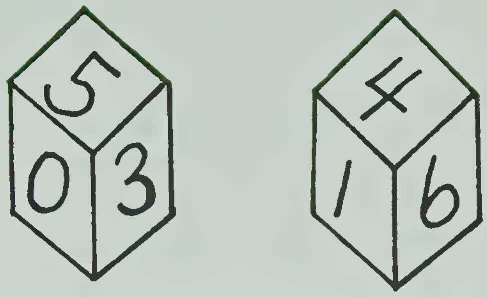
Have each child write questions for the Official Score Card provided on page 205 of the text. The children then exchange papers and answer each other's questions.

☐ ☐ ☐

Have each child make up an Official Score Card and a point system, varying the model provided on page 205. Have the children write questions about the Score Card, exchange papers and solve each other's questions.

☐ ☐ ☐ ☐

For a drill of number facts, roll the dice marked 1 to 6. Call out the numbers and have the children write a fact family. When the pattern has been established, invite children to roll the dice and call out the numbers.

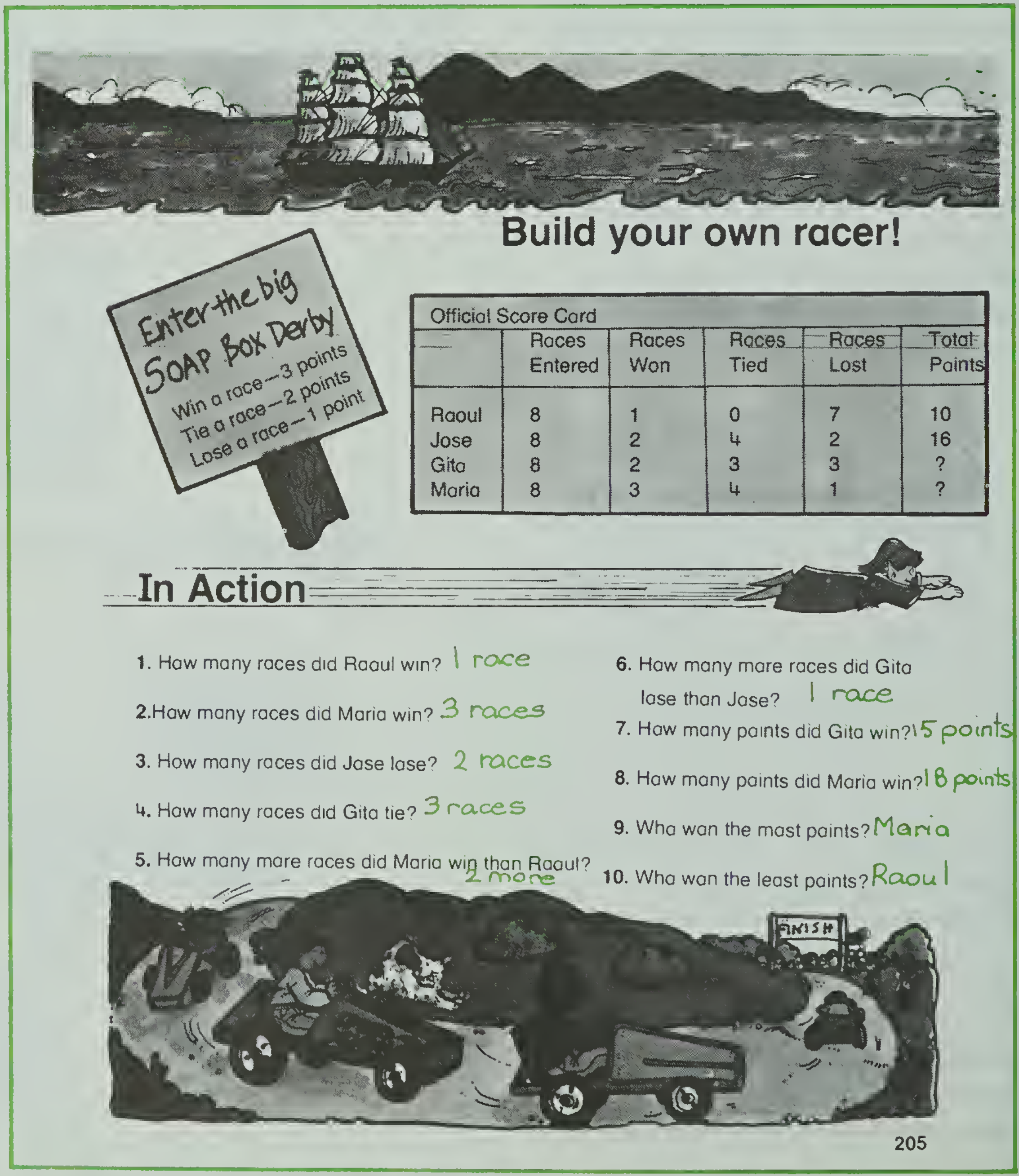


5+4=9 9-4=5
4+5=9 9-5=4
4×5=20 20÷5=4
5×4=20 20÷4=5

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 66 and 67

For Your Notes



Build your own racer!

Enter the big SOAP Box Derby
Win a race—3 points
Tie a race—2 points
Lose a race—1 point

Official Score Card

	Races Entered	Races Won	Races Tied	Races Lost	Total Points
Raoul	8	1	0	7	10
Jose	8	2	4	2	16
Gita	8	2	3	3	?
Maria	8	3	4	1	?

In Action

1. How many races did Raoul win? 1 race
2. How many races did Maria win? 3 races
3. How many races did Jose lose? 2 races
4. How many races did Gita tie? 3 races
5. How many more races did Maria win than Raoul? 2 more
6. How many more races did Gita lose than Jose? 1 race
7. How many points did Gita win? 15 points
8. How many points did Maria win? 18 points
9. Who won the most points? Maria
10. Who won the least points? Raoul

205

Unit 3 Section 4 Lesson 1

Exploring Area: Counting Squares, Creating Designs

Materials

- four 10 cm squares
- sixteen 5 cm squares
- construction paper in several different colours
- masking tape
- for each child
  - 20 cm ruler
  - cutting paper
  - pair of scissors

Rationale

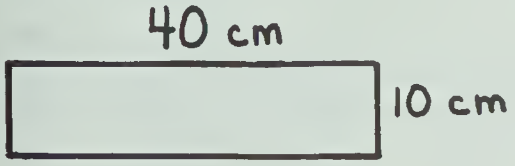
Children often tend to confuse the concepts of area and perimeter. Emphasizing that area involves the number of squares covering a surface, while perimeter involves the distance around, helps children distinguish between the two ideas.

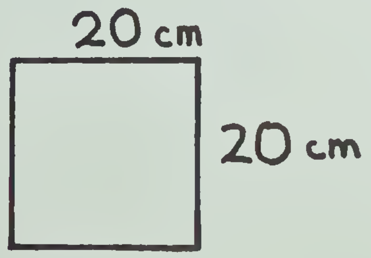
The children should be given many opportunities to cover surfaces with squares of a variety of dimensions, and count the squares. Often, simply counting the squares covering a surface is a useful exercise. Children should have experience with squares ranging from 1 cm square to 20 cm square, and they enjoy making squares for activities in which area is explored.

Lesson

1

Gather the children into the working area, where you have outlined several square and rectangular regions of the floor with masking tape. Make sure that each region will accommodate an exact number of square tiles. The regions illustrated here are appropriate.





Point to a region and ask a child to measure around it with a 20 cm ruler. Discuss the length and width of the region and its *perimeter.*

2

Explain that the region can be measured in another way. Have a child cover the region with 10 cm square tiles. Tell the children that *the area of a region is the number of square units in that region.* Have a child count the tiles and give the area as a number of square tiles.

3

Have a child cover the same surface with 5 cm square tiles, count the tiles and give the area as a number of squares.

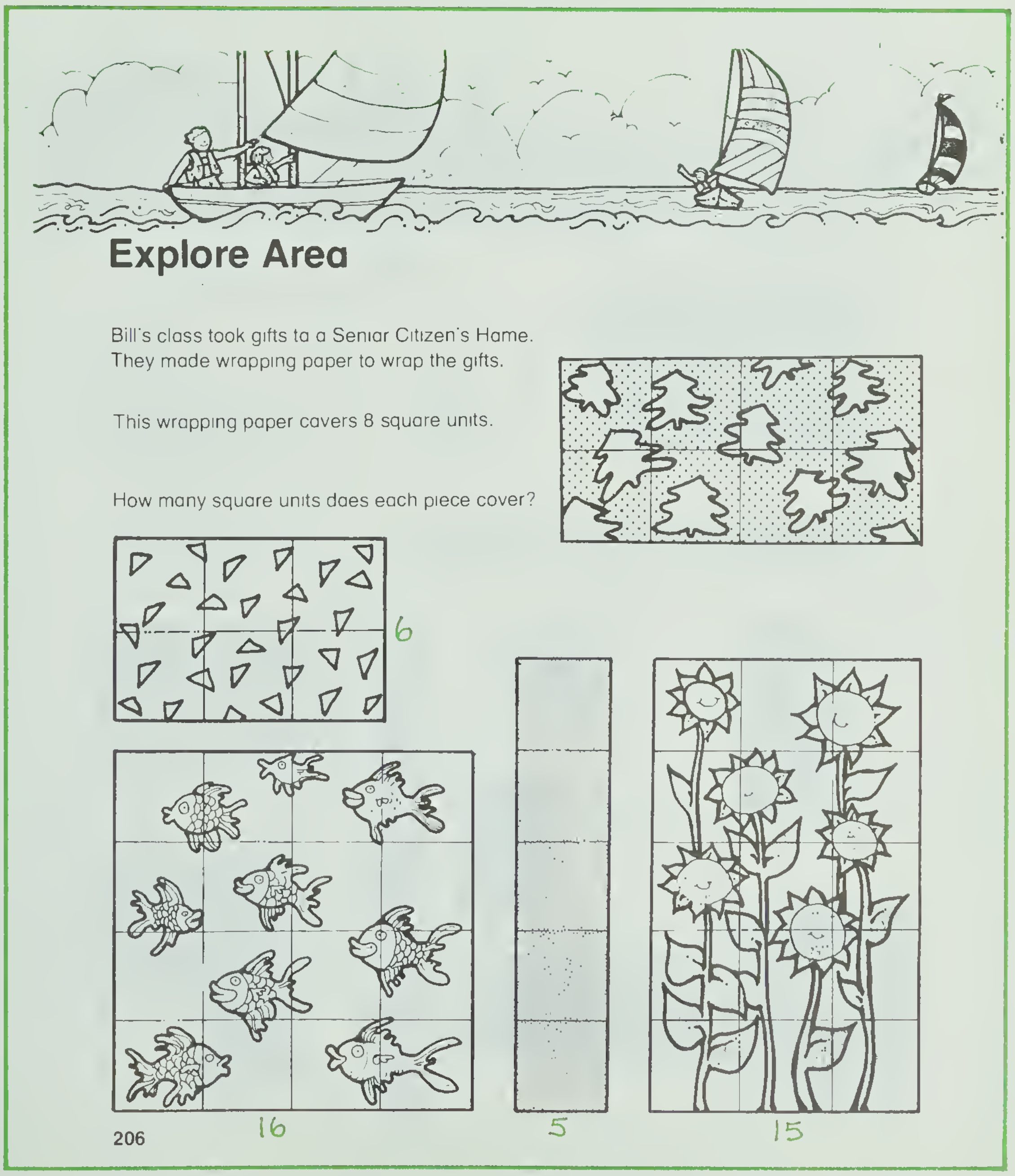
4

Have children find the area of the other region, using tiles 10 cm square, then using the 5 cm square tiles.

5

Have the children use coloured construction paper to make a supply of squares in three different sizes: 10 cm square, 5 cm square and 20 cm square. Have them use a different colour for each size. Instruct the children to select a surface and decide on the appropriate size of squares to use for measuring its area. Each child estimates the number of squares needed to cover the surface, then covers the surface and counts the squares to find the area.

Have the children repeat the activity,



Explore Area

Bill's class took gifts to a Senior Citizen's Home.
They made wrapping paper to wrap the gifts.

This wrapping paper covers 8 square units.

How many square units does each piece cover?

6

16

5

15

206

measuring several surfaces in the classroom. If they wish, have them measure the same surface with squares of different dimensions and make charts to record the area in square units of each colour.

Surface	Square	Estimate of Area	Measurement of Area
desk top	red	10 red squares	9 red squares
desk top	blue	30 blue squares	36 blue squares

Written and Other Activities

☐

mathways 3, pages 206, 207

Discuss the Explore section, inviting children to comment on the desirability of measuring area accurately before purchasing tiles, carpeting, and so on. For page 207, provide cutting paper, and have the children record each area as a number of squares.

☐ ☐

Have the children measure and count the tiles covering surfaces at home or in the school and report the area of each surface measured to the class. Ceiling tiles, floor tiles and wall tiles in kitchens and bathrooms are some suggestions.

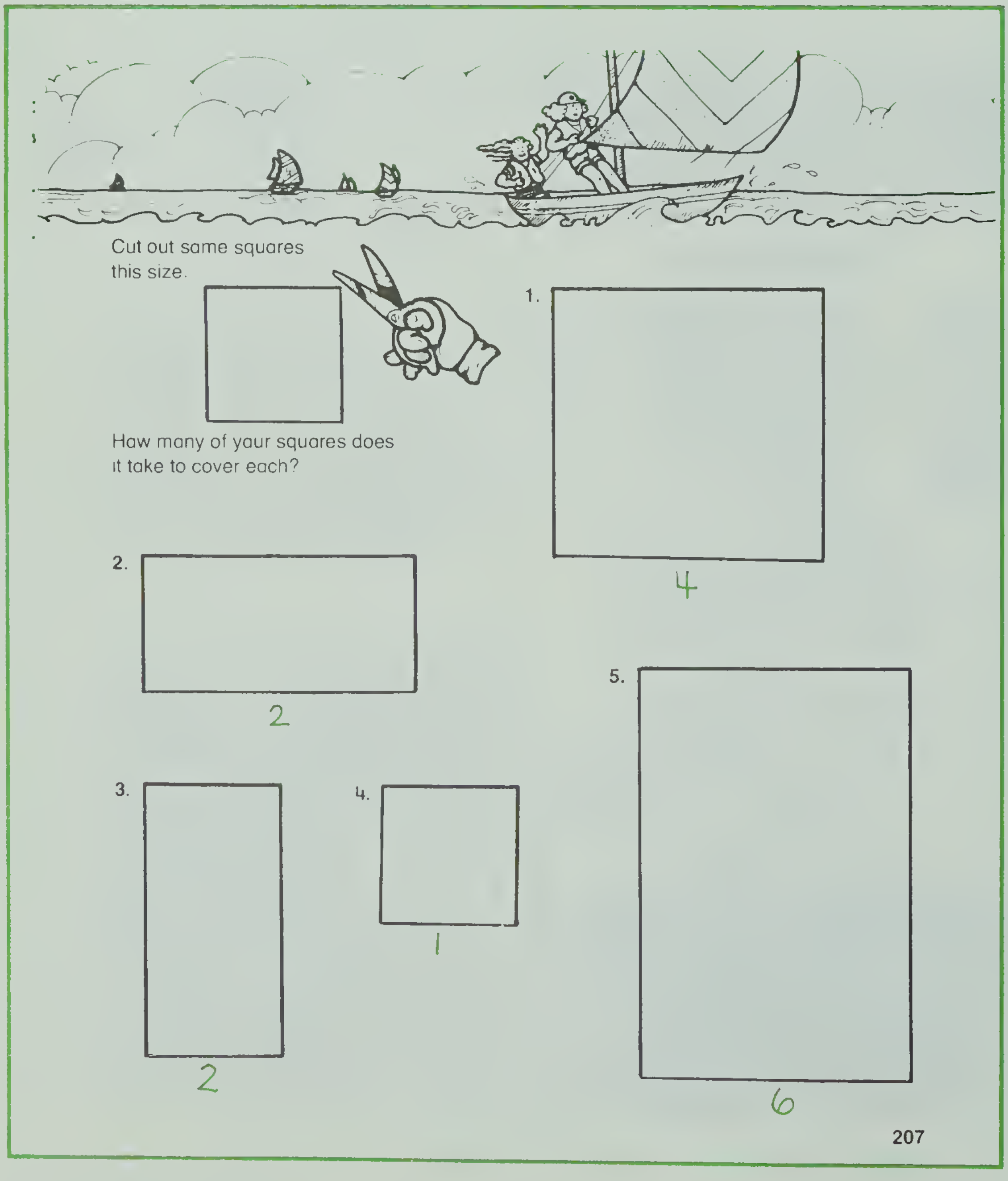
☐ ☐ ☐

Conduct an art lesson in which the children create designs, using small squares cut from construction paper of two or three different colours. Each child should be encouraged to choose one size in a variety of colours, so that the design each creates will be different.

The children glue the squares on a larger piece of construction paper, covering the entire surface without overlapping the squares, and sign their artwork. Display the designs in the classroom.

☐ ☐ ☐ ☐

Have each child estimate then measure four designs created by other children, recording each artist's name, and the estimated and actual area expressed as a number of squares. Remind the children to deal with one design at a time, since counting squares before making the next estimate will help them estimate more accurately when finding the area of the next design.



Cut out some squares this size.

How many of your squares does it take to cover each?

1. 4
2. 2
3. 2
4. 1
5. 6

207

Unit 3 Section 4 Lesson 2

Exploring Area: Counting Square Centimetres, Writing the Symbol cm^2

Materials

- display-size squared paper showing various regions in different colours
- for each child
  - copies of Program Master 5

Rationale

In previous lessons, the children used non-standard units to measure area. In this lesson, their knowledge is extended to include the concept of square centimetres and the symbol cm^2.

Lesson

1

Gather the children around the working area and display the squared paper. Point to a coloured region and ask a child to state the area. Have the child count the squares and give the area as a number of squares.

Repeat the procedure for each region on the display.

2

Distribute copies of Program Master 5. Have the children colour six regions, each region being comprised of a whole number of squares, count the squares and then give the area of each. Show and discuss several examples of the children's work.

3

Introduce the term *square centimetre,* explaining that it is a square region whose four sides are each exactly 1 cm long. Write on the easel

square centimetre cm^2

Explain that cm is the abbreviation for centimetre and that the 2 refers to two dimensions: length and width.

Have each child cut a 1 cm by 1 cm square from 1 cm graph paper, reproduced from Program Master 5.

4

When the children seem to have some understanding of area in square centimetres, distribute copies of Program Master 5. Have the children outline, colour and label two figures having the following areas: 10 cm^2; 20 cm^2; 18 cm^2; 4 cm^2; 11 cm^2. Then have the children count to find the perimeter of each figure. Have them record the perimeter beside the area. Compare the various figures created by the children, reviewing the meaning of *rectangle* and emphasizing that a square is a type of rectangle.

Written and Other Activities

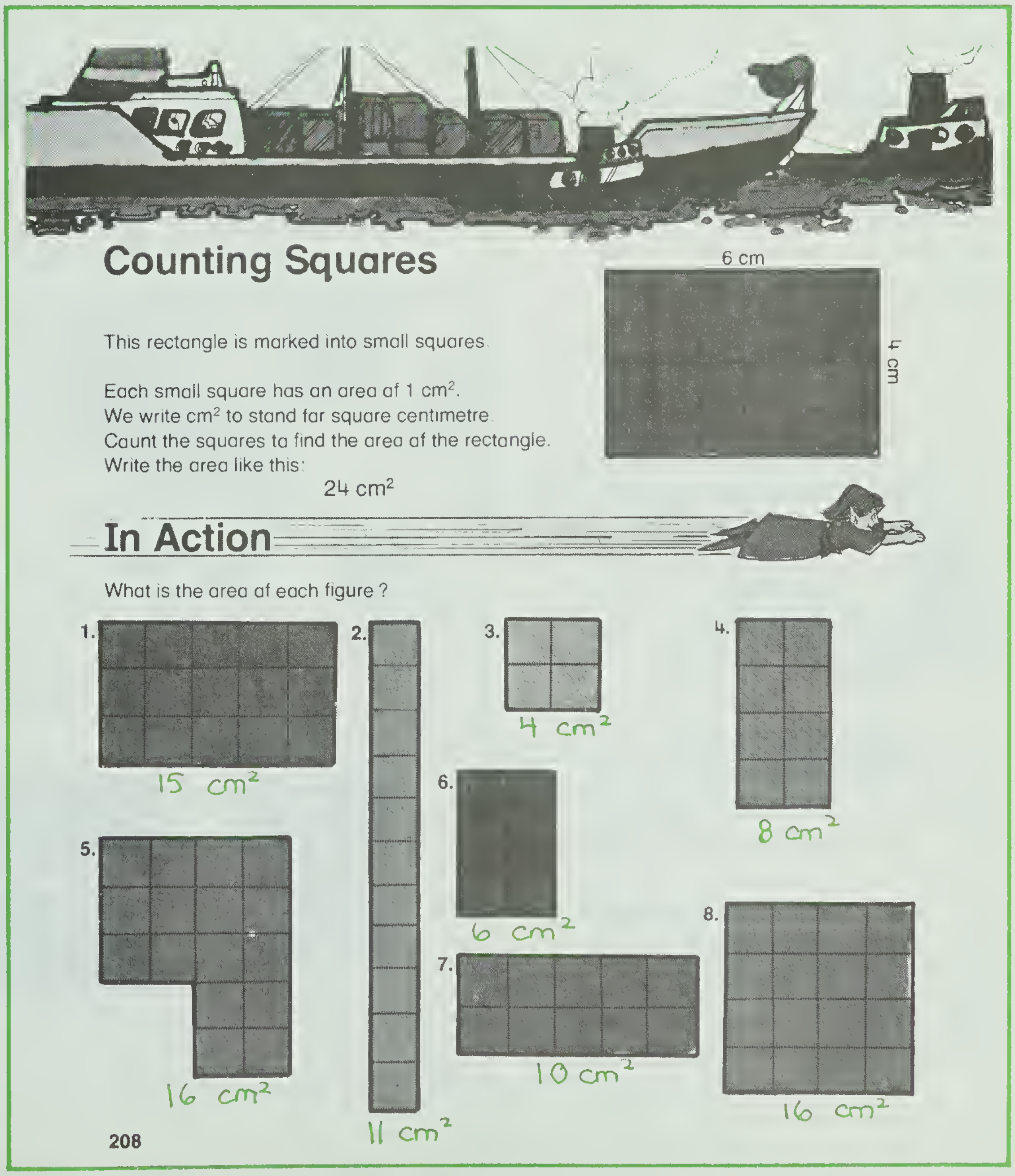
☐

mathways 3, page 208

Discuss the example, eliciting from children the meaning of *rectangle, square, square centimetre* and the symbol cm^2. When assigning the In Action questions, remind the children to use the symbol cm^2 to record each area.

☐ ☐

mathways 3 Plus Workbook page 68



Counting Squares

6 cm

4 cm

This rectangle is marked into small squares.

Each small square has an area of 1 cm^2.
We write cm^2 to stand for square centimetre.
Count the squares to find the area of the rectangle.
Write the area like this:

24 cm^2

In Action

What is the area of each figure?

1. 15 cm^2
2. 11 cm^2
3. 4 cm^2
4. 8 cm^2
5. 16 cm^2
6. 6 cm^2
7. 10 cm^2
8. 16 cm^2

208

Unit 3 Section 4 Lesson 3

Recalling Multiplication and Division Facts, Recalling Area

Materials

- for each child
  - 1 cm graph paper reproduced from Program Master 5
- squares made for Section 4, Lesson 1

Rationale

Since *mathways 3* page 209 is a review, the amount of time spent on the lesson before assigning the text page will depend on the skill demonstrated by the children when the concepts were being taught. When the children have completed the questions on the Retrace Your Steps page, a quick review of their answers will indicate what topics, if any, require further practise. Based on these results, activities provided for the relevant text pages can be selected for reteaching as necessary.

Lesson

1

Gather the children around the working area. Quickly review several multiplication and division facts, asking questions such as

What is 3 times 9?

What is 72 divided by 8?

2

Have a child cover a surface with squares, count the squares and record the area on the easel, using the symbol cm². Repeat, involving other children and selecting different surfaces.

Written and Other Activities

☐

mathways 3, page 209

Discuss with the children the appropriate procedure to use to answer the questions in each section.

☐ ☐

Have the children draw pictures to illustrate several questions between 5 and 37. Have them write two multiplication sentences and two division sentences for each picture.

☐ ☐ ☐

Distribute copies of Program Master 5. Have the children use the 1 cm graph paper to colour regions having the same area but a different shape from one or several of the regions shown in questions 38 to 41 on page 209.

☐ ☐ ☐ ☐

Provide a drill of number facts in the following manner:

8 add 8, divide by 2, multiply by 4.

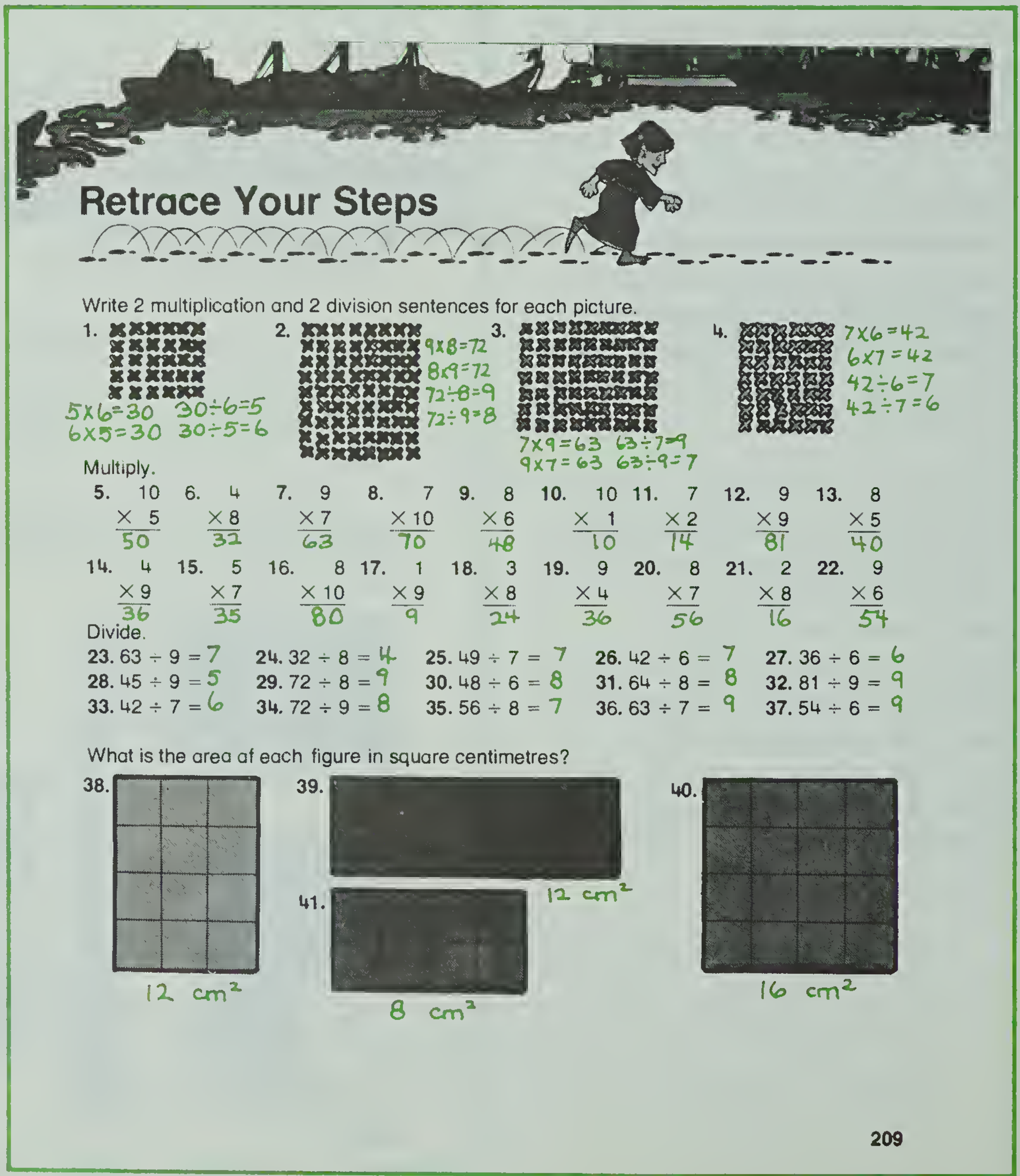
6 times 7, divide by 7, subtract 6.

25, add 10, divide by 5, multiply by 8.

Tailor the pace of the drill to the group.

☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 46



Retrace Your Steps

Write 2 multiplication and 2 division sentences for each picture.

1. 5x6=30 6x5=30 30÷6=5 30÷5=6

2. 9x8=72 8x9=72 72÷8=9 72÷9=8

3. 7x9=63 9x7=63 63÷7=9 63÷9=7

4. 7x6=42 6x7=42 42÷6=7 42÷7=6

Multiply.

5.	6.	7.	8.	9.	10.	11.	12.	13.
10	4	9	7	8	10	7	9	8
× 5	× 8	× 7	× 10	× 6	× 1	× 2	× 9	× 5
50	32	63	70	48	10	14	81	40

14.	15.	16.	17.	18.	19.	20.	21.	22.
4	5	8	1	3	9	8	2	9
× 9	× 7	× 10	× 9	× 8	× 4	× 7	× 8	× 6
36	35	80	9	24	36	56	16	54

Divide.

23. 63 ÷ 9 = 7
24. 32 ÷ 8 = 4
25. 49 ÷ 7 = 7
26. 42 ÷ 6 = 7
27. 36 ÷ 6 = 6
28. 45 ÷ 9 = 5
29. 72 ÷ 8 = 9
30. 48 ÷ 6 = 8
31. 64 ÷ 8 = 8
32. 81 ÷ 9 = 9
33. 42 ÷ 7 = 6
34. 72 ÷ 9 = 8
35. 56 ÷ 8 = 7
36. 63 ÷ 7 = 9
37. 54 ÷ 6 = 9

What is the area of each figure in square centimetres?

38. 12 cm²
39. 12 cm²
40. 16 cm²
41. 8 cm²

Unit 3 Section 4 Lesson 4

Exploring Temperature: Reading and Comparing Temperatures Above 0°C

Materials

- demonstration thermometer, *see Overview 7*
- several Celsius thermometers
- glasses
- tap water, cold water and ice cubes
- several newspapers reporting temperatures above 0°C

Lesson

1

Invite the children into the working area and show 10°C on the thermometer. Record on the easel

10 degrees Celsius 10°C

Discuss with the children the meaning of the term *degrees Celsius* and the symbol *°C*. Have a child read the temperature shown on the thermometer and recorded on the easel. Discuss appropriate clothing, outdoor activities and so on for that temperature. Then show another temperature on the thermometer and have a different child read the temperature and record it on the easel, using the symbol. Repeat the discussion for that temperature. Repeat until several children have had an opportunity to read and record a temperature, and several temperatures have been reviewed and discussed.

2

Write several temperatures on the easel and have different children show them on the demonstration thermometer.

3

Pointing to two different temperatures recorded on the easel, ask which of the two is warmer. Have a child subtract one temperature from the other to find out how much warmer. Repeat several times. Of course all temperatures should be above freezing for this activity.

3

Have several children in the group examine old newspapers to find the temperature for the day each paper was published. Have each child read the date and the temperature, and describe the feel of the weather on that day, telling whether it was colder or warmer than today. Discuss with the children how the temperature on a given day fluctuates. Have a different child show each of the temperatures reported in the newspapers on the demonstration thermometer.

Written and Other Activities

☐

mathways 3, page 210

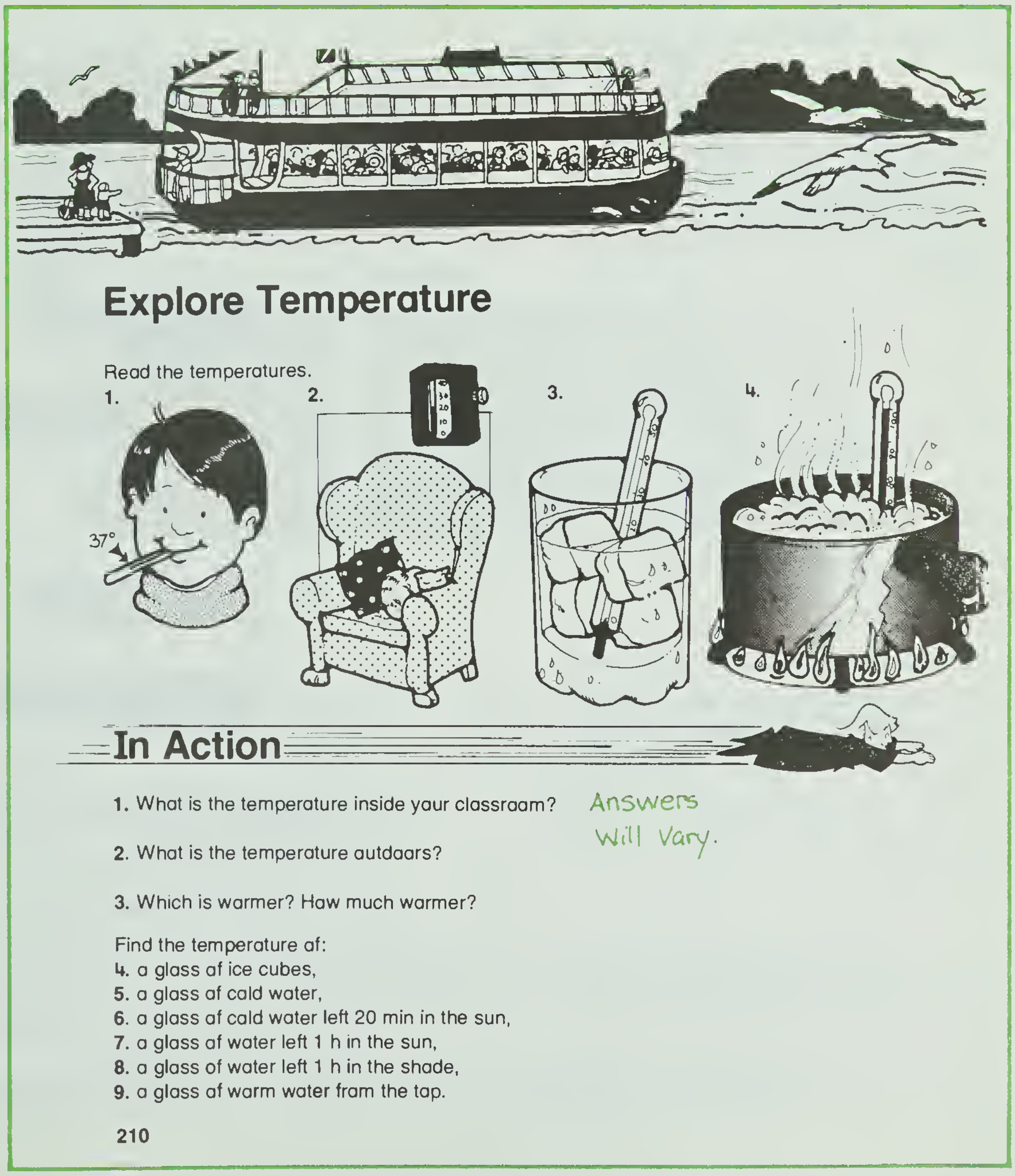
Discuss the Explore section, inviting different children to read the thermometers shown and describe the temperatures. Then provide the materials needed for completing the In Action investigation.

☐ ☐

Each morning, ask several children to predict the high and low temperature for the day. Record these estimates. Then have the children listen to or watch a weather report to find out the actual high and low for the day and report these to the class.

☐ ☐ ☐

Appoint children to take the temperature inside the classroom, at some other location in the school, and outdoors. Have them record the time, the temperature and the location. Then have the children take the temperature in these same locations at a different time and report any fluctuations. These temperatures can be recorded on a class chart and compared.



Explore Temperature

Read the temperatures.

1.

2.

3.

4.

In Action

1. What is the temperature inside your classroom?
2. What is the temperature outdoors?
3. Which is warmer? How much warmer?

Answers Will Vary.

Find the temperature of:
4. a glass of ice cubes,
5. a glass of cold water,
6. a glass of cold water left 20 min in the sun,
7. a glass of water left 1 h in the sun,
8. a glass of water left 1 h in the shade,
9. a glass of warm water from the tap.

210

Unit 3 Section 4 Lesson 5

Exploring Temperature: Graphing Temperature

Materials

- Celsius thermometer, affixed outside the classroom window
- display-size graph
- for each child
  - 1 cm by 1 cm graph paper reproduced from Program Master 5

Lesson

1

Invite the children to join you in the working area. Display a graph for recording temperatures, similar to the graph on *mathways 3* page 211.

Ask

What do you think the temperature outside is now? Why do you think that?

Record the children's estimates on the easel. Then have a child read the outdoor thermometer and state the temperature. Compare the estimates and the actual temperatures. Colour the graph to show the actual temperature. Have children predict a temperature for each day in the current week and indicate on the graph how far each colour bar would extend. Discuss the usefulness of the graph for comparing the temperatures. Appoint children to take the temperature outdoors on each day of the week, at the same time of day, and fill in the graph accordingly.

2

Ask several children to estimate the temperature in the classroom and to justify their estimates. Record these estimates on the easel. Then have a child read the indoor thermometer and state the actual temperature. Compare the estimates and the actual temperatures.

3

Distribute the graph paper. Have each child select a city whose temperature is given in the newspaper each day. Locate each of the cities chosen on a map and tell the children something about the cities. Instruct the children to make a graph showing the temperature of the chosen city. The graphs can be displayed beside the map of the world.

Written and Other Activities

☐

mathways 3, page 211

Discuss the graph shown on the page, asking different children to read the temperature shown for each day.

What was the temperature on Wednesday? On Monday?

Then state a temperature shown on the graph and ask

On what day of the week was the temperature 5°C?

Discuss each of the In Action questions and distribute graph paper needed for question 6.

☐ ☐

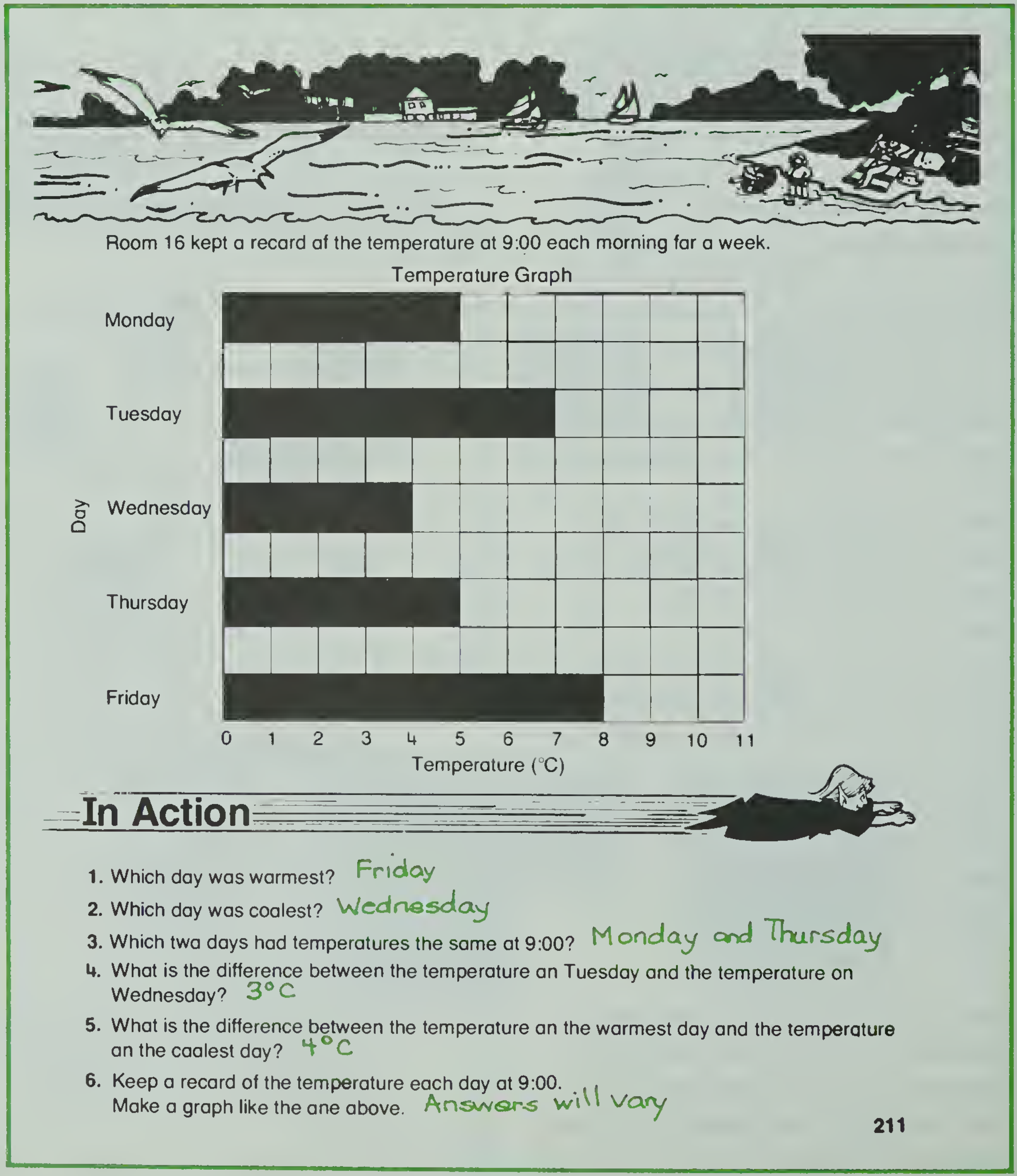
Assign children the task of reading a thermometer to find the temperature in different locations at noon and immediately after school. These temperatures are to be shown on graphs. After several days, display the graphs and compare them.

☐ ☐ ☐

mathways 3 Practice Masters page 48

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 69



Room 16 kept a record of the temperature at 9:00 each morning for a week.

In Action

1. Which day was warmest? Friday
2. Which day was coolest? Wednesday
3. Which two days had temperatures the same at 9:00? Monday and Thursday
4. What is the difference between the temperature on Tuesday and the temperature on Wednesday? 3°C
5. What is the difference between the temperature on the warmest day and the temperature on the coolest day? 4°C
6. Keep a record of the temperature each day at 9:00. Make a graph like the one above. Answers will vary

211

Unit 3 Section 5 Lesson 1

Recalling Place Value and Expanded Numerals for Three-Digit Numbers

Materials

- for each child
  - place-value mat
  - place-value materials: 100-flats, 10-strips, unit strips, nine of each

Rationale

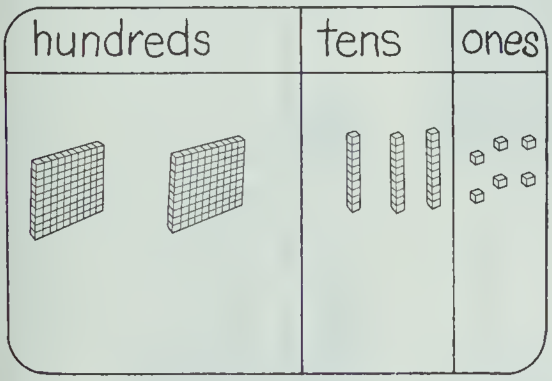
Place-value and expanded numerals for three-digit numbers were introduced on *mathways 3* pages 110 to 113. This and following lessons constitute a review and an expansion of the concepts presented earlier.

If the activities in this first lesson reveal that the children do not have a firm enough understanding of the ideas, design activities that involve the use of concrete materials and use them to supplement the activities described here.

Lesson

1

Gather the children around the working area. On a place-value mat, show a three-digit number. Write the meaning, the expanded numeral and the standard numeral on the easel.



meaning
2 hundreds 3 tens 6 ones

expanded numeral
200 + 30 + 6

standard
numeral 236

Repeat the activity several times. Include numbers with zero tens, zero ones, and zero tens and ones, for example 201, 350 and 600. Then invite children to show three-digit numerals on their mats. Have other children write the meaning, expanded numeral and standard numeral for each number on the easel.

2

Write a three-digit numeral on the easel and have the children show it on their mats. Have one child in the group write the expanded numeral and the meaning on the easel. Repeat several times.

3

Write on the easel

2 hundreds 5 tens and 7

Have a child write the standard numeral on the easel. Repeat, using several other examples and giving each child an opportunity to participate.

Written and Other Activities

☐

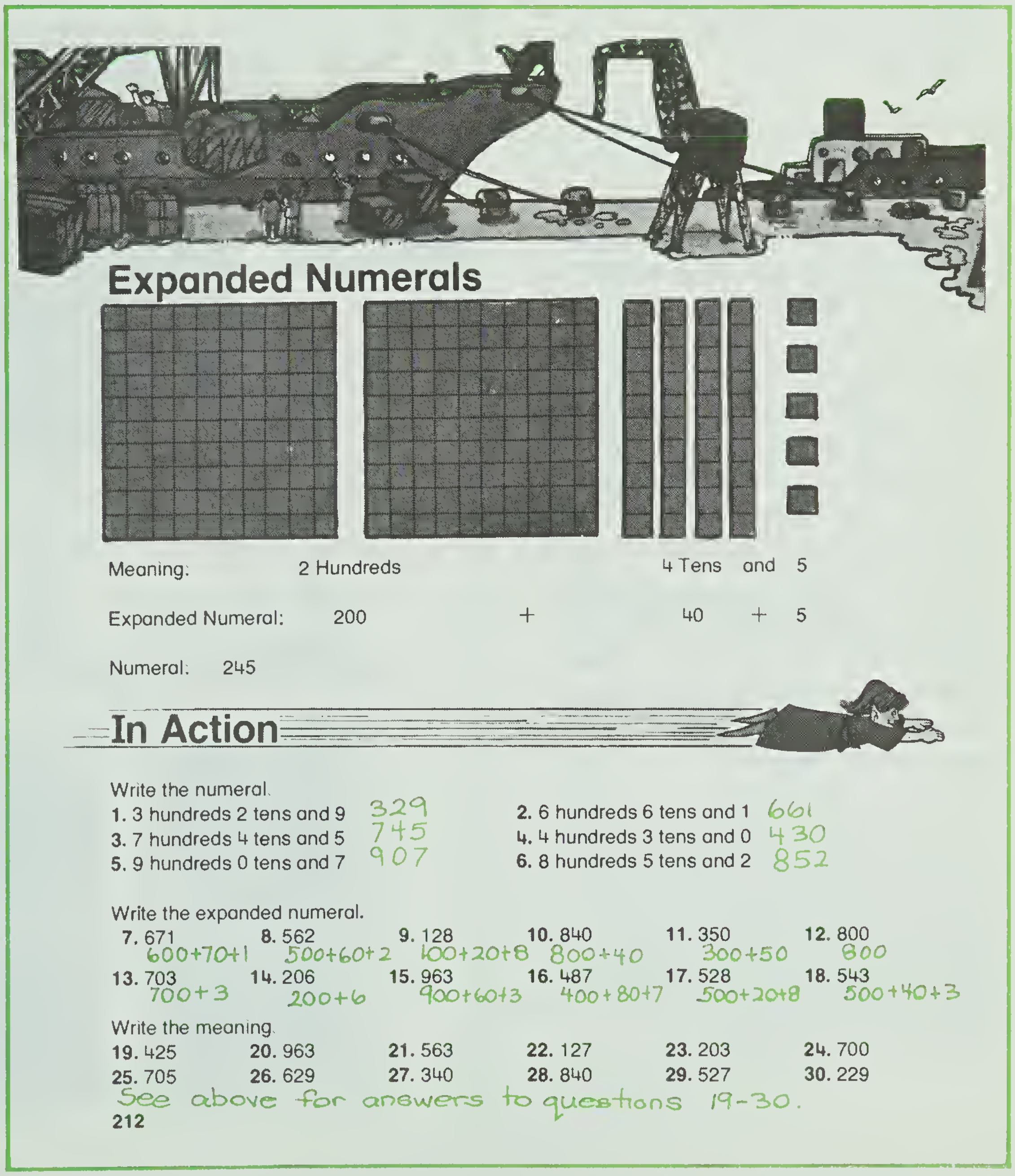
mathways 3, page 212

Discuss the example given and assign the In Action questions

Have the children draw pictures of place-value materials on mats to represent several of the numbers given on page 212, as well as some two-digit and single-digit numbers.

Additional Answers

19. 4 hundreds 2 tens +5
20. 9 hundreds 6 tens +3
21. 5 hundreds 6 tens +3
22. 1 hundred 2 tens + 7
23. 2 hundreds 0 tens + 3
24. 7 hundreds 0 tens + 0
25. 7 hundreds 0 tens + 5
26. 6 hundreds 2 tens + 9
27. 3 hundreds 4 tens + 0
28. 8 hundreds 4 tens + 0
29. 5 hundreds 2 tens + 7
30. 2 hundreds 2 tens + 9



Expanded Numerals

Meaning: 2 Hundreds 4 Tens and 5

Expanded Numeral: 200 + 40 + 5

Numeral: 245

In Action

Write the numeral.

1. 3 hundreds 2 tens and 9 329
2. 6 hundreds 6 tens and 1 661
3. 7 hundreds 4 tens and 5 745
4. 4 hundreds 3 tens and 0 430
5. 9 hundreds 0 tens and 7 907
6. 8 hundreds 5 tens and 2 852

Write the expanded numeral.

7. 671 600+70+1
8. 562 500+60+2
9. 128 100+20+8
10. 840 800+40
11. 350 300+50
12. 800 800
13. 703 700+3
14. 206 200+6
15. 963 900+60+3
16. 487 400+80+7
17. 528 500+20+8
18. 543 500+40+3

Write the meaning.

19. 425
20. 963
21. 563
22. 127
23. 203
24. 700
25. 705
26. 629
27. 340
28. 840
29. 527
30. 229

See above for answers to questions 19-30.

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Unit 3 Section 5 Lesson 2

Representing Three-Digit Numbers on an Abacus

Materials

- abacus *or* copy of Program Master 27, mounted on cardboard and laminated
- for each child
  - place-value mat
  - place-value materials: 100-flats, 10-strips, unit strips (nine of each)
  - copy of Program Master 28
  - copy of stencil
- for each pair of children
  - abacus *or* copy of Program Master 27, mounted on cardboard and laminated
- for groups of three or four
  - three dice, one marked 0 to 5, one marked 4 to 9, and one marked 1, 3, 5, 7, 8, 9
- gameboard and numeral cards, *see* ☐ ☐ ☐ ☐ ☐
- markers

Rationale

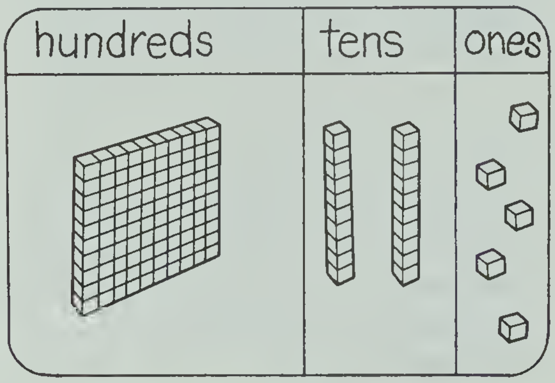
It is important for children to experience a variety of ways of representing and regrouping numbers. Comparing several methods will help the children to understand that the same number can be represented in several ways. For this reason, the abacus is presented and explored in this and following lessons. If abaci are not available in sufficient quantities, reproduce the large abacus on Program Master 27 and give a copy to each child. These can be mounted on Bristol board and laminated so that discs can be drawn in grease pencil or overhead pens and erased as necessary. Counters could also be placed on the "wires".

Provide an opportunity for the children to explore the abacus before and during lessons on place-value. To emphasize that the abacus is not restricted to three-digit numbers, include single-digit and two-digit numbers in the activities.

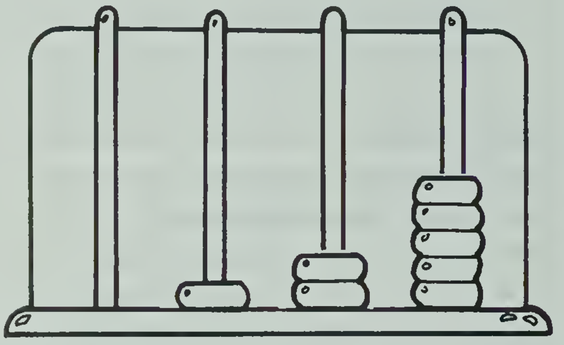
Lesson

1

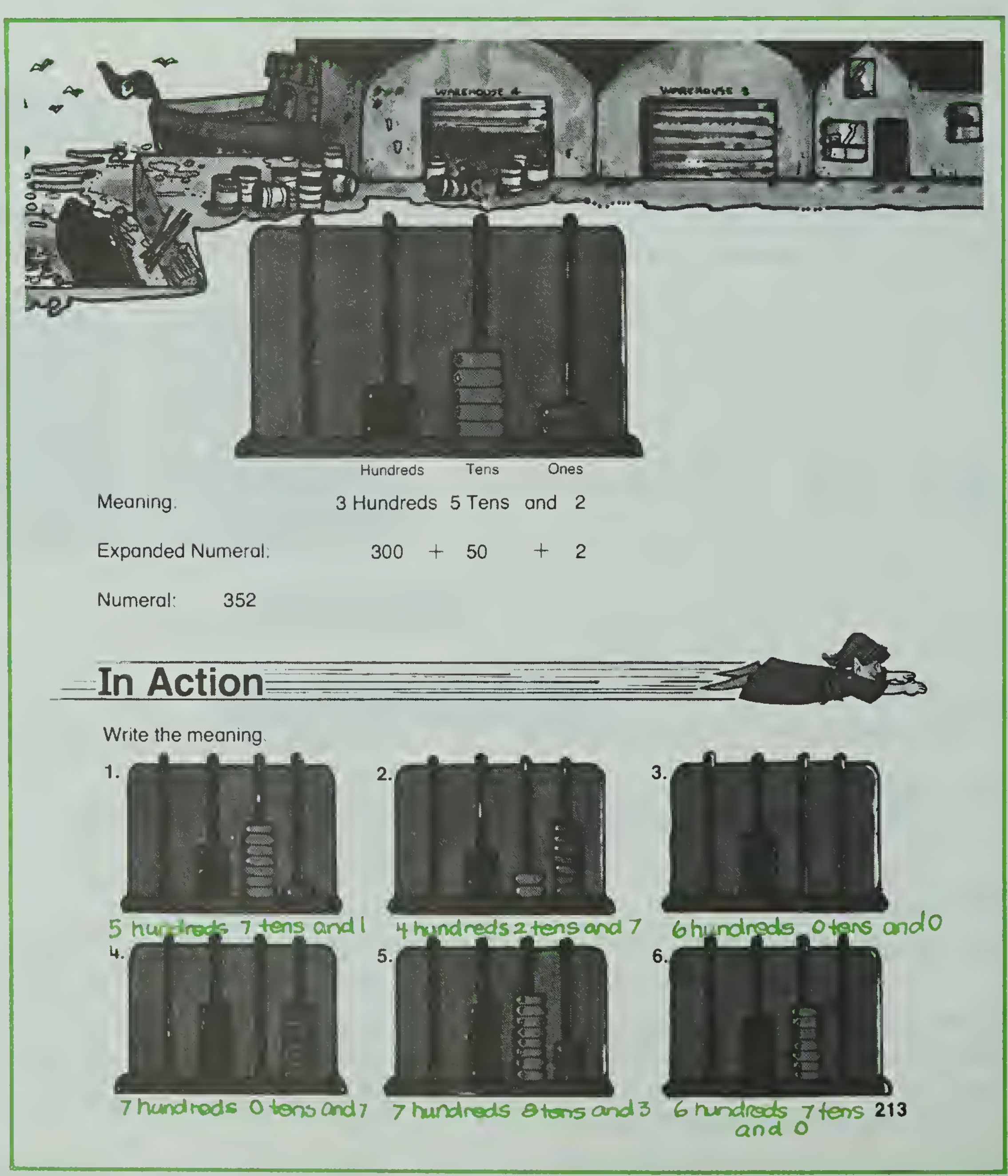
Gather the children around the working area and distribute place-value mats and materials. Write 125 on the easel. Have the children use their mats and materials provided to show the numeral.



Introduce the abacus, explaining how it functions, and show 125.



Point out the eight hundred-discs, two ten-discs and five one-discs. Compare the two methods of representing 825. Give each pair of children an abacus to work with. Have them represent one-,



Meaning. 3 Hundreds 5 Tens and 2

Expanded Numeral: 300 + 50 + 2

Numeral: 352

In Action

Write the meaning.

1. 5 hundreds 7 tens and 1
2. 4 hundreds 2 tens and 7
3. 6 hundreds 0 tens and 0
4. 7 hundreds 0 tens and 7
5. 7 hundreds 8 tens and 3
6. 6 hundreds 7 tens and 0

213

two- and three-digit numbers on the abacus. Include numbers such as the following: 30, 904, 320, 500. Emphasize the place value for each.

2

Show a number on the abacus. Ask a child to state the number represented and write the meaning, the expanded numeral and the standard numeral on the easel. Repeat several times, representing one- and two-digit numbers as well as three-digit numbers, and involving each child in the group.

3

Write a numeral on the easel. Have the children represent the number on the abacus. Repeat several times, selecting numbers having one to three digits.

4

Instruct each pair of children to record five numbers. Each pair then teams up with another pair. One pair demonstrates each number on the abacus and the second pair writes the numeral in expanded and standard form on a sheet of paper and gives it to the original pair to check. When the first pair has represented all five numbers, the second pair represents the five numbers they have written for the other to write in two ways.

5

Distribute copies of a stencil made from Program Master 28, on which discs have been drawn to represent one-, two-, and three-digit numbers. Instruct the children to write the meaning, the expanded numeral and the standard numeral under each abacus shown.

Written and Other Activities

☐

mathways 3, pages 213, 214

Discuss the example, comparing the number shown on the abacus with the same number represented on a place-value mat.

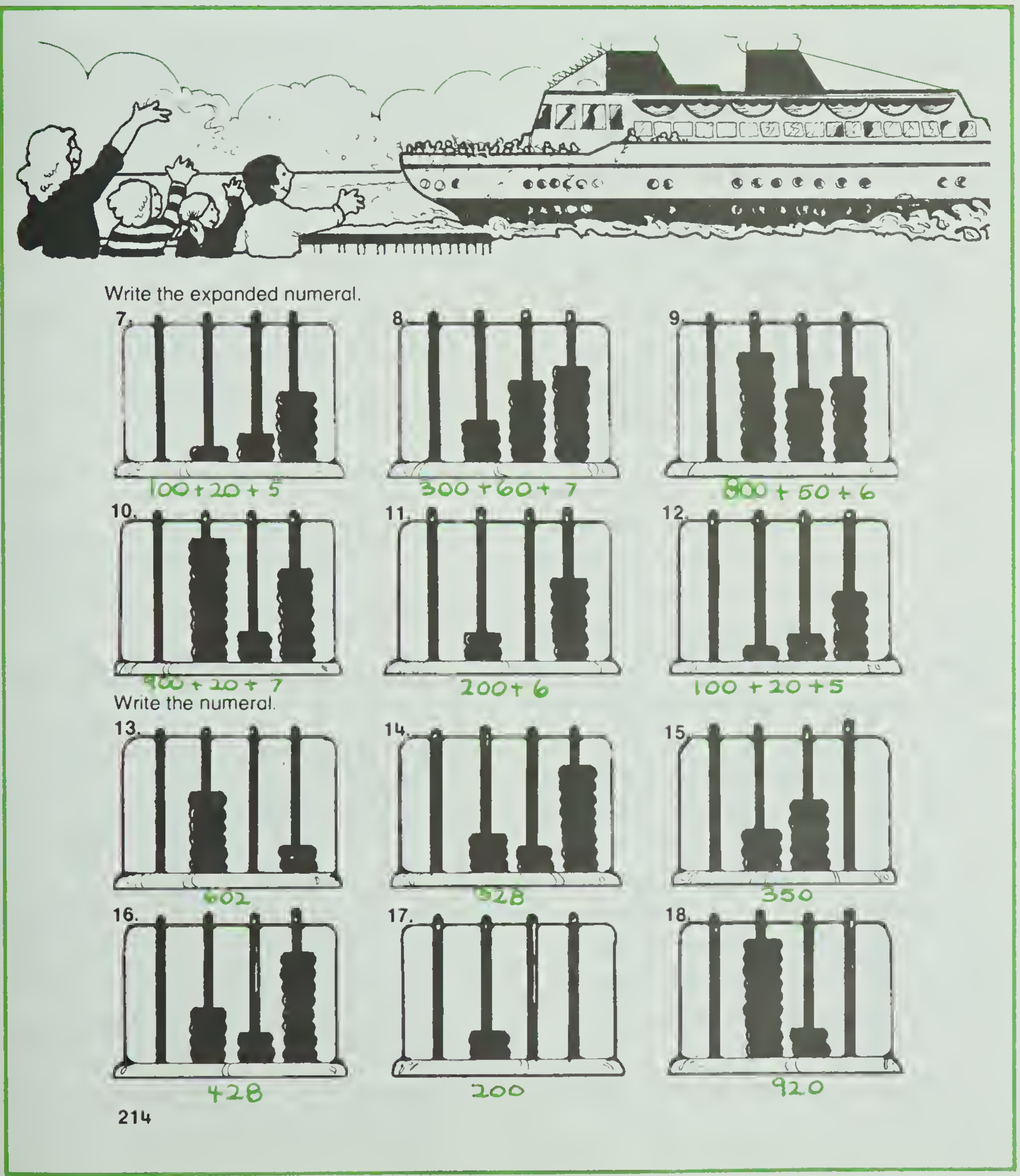
☐ ☐

Give each child two copies of Program Master 28. Write the following on the easel:

1. *400 + 20 + 7*
2. *9 hundreds 0 tens and 3*
3. *5 tens and 2*
4. *681*
6. *200 + 60 + 8*
7. *6 hundreds 1 ten and 4*
8. *100 + 30*
9. *53*
10. *800 + 7*
11. *390*
12. *7 hundreds 7 tens and 7*
13. *8 tens and 0*
14. *1*
15. *800*
16. *2 hundreds 4 tens and 0*
17. *60 + 4*
18. *201*
19. *300 + 70 + 9*
20. *40*
21. *905*
22. *40 + 3*
23. *2 hundreds 0 tens and 3*
24. *423*

Have the children number the abaci from 1 to 24. Instruct them to show each number on an abacus and write the number three ways. For example

400 + 20 + 7
4 hundreds 2 tens and 7
427



Write the expanded numeral.

7. 100 + 20 + 5
8. 300 + 60 + 7
9. 800 + 50 + 6
10. 400 + 20 + 7
11. 200 + 6
12. 100 + 20 + 5

Write the numeral.

13. 602
14. 328
15. 350
16. 428
17. 200
18. 920

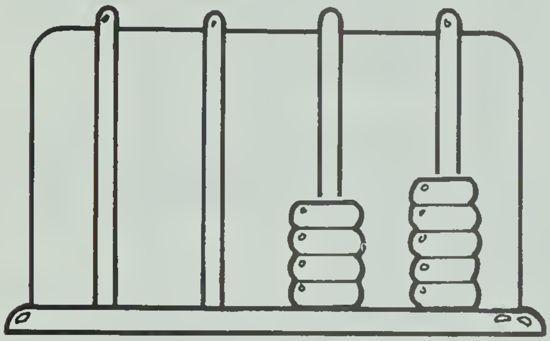
214

☐ ☐ ☐

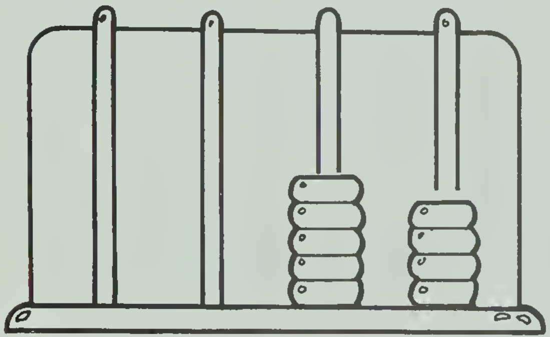
Have small groups of children work with an abacus. Each member of the group shows a number on the abacus and the other children record the number in three ways. The children compare papers to check their work.

☐ ☐ ☐ ☐

Mark one die 0 to 5, and another 4 to 9. A small group of children take turns tossing the dice. After each toss, the children show as many two-digit numbers as possible on abaci or on copies of Program Master 28, and record the numeral.



45



54

Add the die marked 1, 3, 5, 7, 8, 9. Have the children toss all three dice and write as many three-digit numbers as they can, again showing each on an abacus or recording them on the Program Master.

The activity can be varied, with one child tossing the dice and each of the other children in the group showing one of the numbers that can be made with the three numerals on the die faces, either on the abacus or on the copy of the Program Master. Each child records all the numbers, one under the other.

☐ ☐ ☐ ☐ ☐

To reinforce place value have the children play this game. Prepare a gameboard like the following.

854	897	302	765	170	084	742
436	102	547	832	945	159	236
670	893	457	361	826	264	738
237	256	238	764	479	386	597
594	184	605	953	307	498	251
870	123	276	458	985	720	814
469	958	791	103	637	356	910

Make three cards for each of the numerals from 0 to 3, two cards for each of the numerals 4 to 6, one card for the numerals 7 to 9 and three wild cards. Each player places a distinctive counter on any square on the gameboard. The first player draws a card from the shuffled deck and moves her or his marker one square in any direction to a square containing the digit on the drawn card. For example, if the player's marker was on 764 and a card showing 6 turned up, the player would have three choices – move to 605, 361 or 826. The player makes a decision and moves to one of the three squares. The player then records her or his score – it being the value of the digit (which corresponds to the numeral on the upturned card) on the square to which he or she moved the marker. For example, if a player drew a 7 and moved to a square numbered 764, that player's score would be 700. If, on the other hand, the square was numbered 173, the score obtained would be 70. The player with the highest total score when all of the cards have been drawn is the winner.

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 47

☐ ☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 70

For Your Notes

Unit 3 Section 5 Lesson 3

Adding 2 Two-Digit Numbers: Exchanging 10 Ones for 1 Ten

Materials

- abacus and pegs
- for each child
  - abacus and pegs *or* copy of Program Master 27
  - copy of Program Master 28
- for groups of four children
  - set of numeral cards marked 0 to 9
  - box
  - markers

Rationale

Addition involving addends having two digits and requiring regrouping was introduced earlier. In the activities provided for these introductory lessons, the children used place-value mats and materials. Here, the children's experience is expanded to include regrouping with the assistance of an abacus. Using different concrete materials for adding and regrouping helps make the concepts involved clear to the children.

Lesson

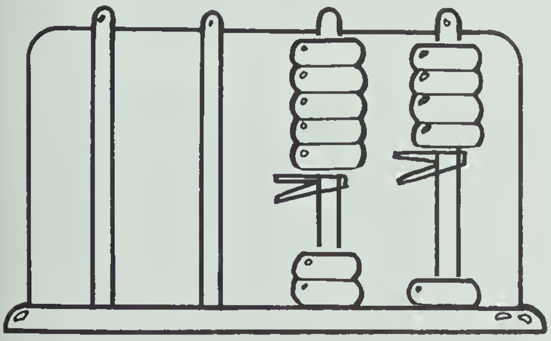
1

Gather the children around the easel. Write an addition question that does not require regrouping.

Add.

21
+54

Show each addend on the abacus, separating them with pegs, as illustrated.



Remove the peg from the ones wire and then from the tens wire, combining the discs. Ask a child to state the number of ones. Record the numeral in the appropriate space allowed for the sum. Have another child state the number of tens and record the numeral in the sum.

Add.

21
+54
75

Give each child an abacus and pegs. Write several similar questions that do not involve regrouping and have children demonstrate each on the abacus. Include questions that have zero ones in each or both addends, for example

20	*45*	*60*
+31	*+10*	*+30*

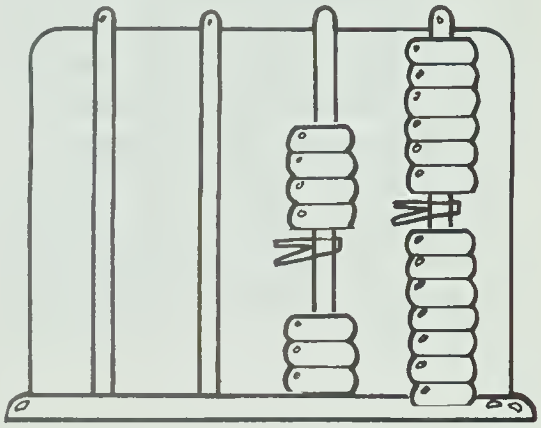
2

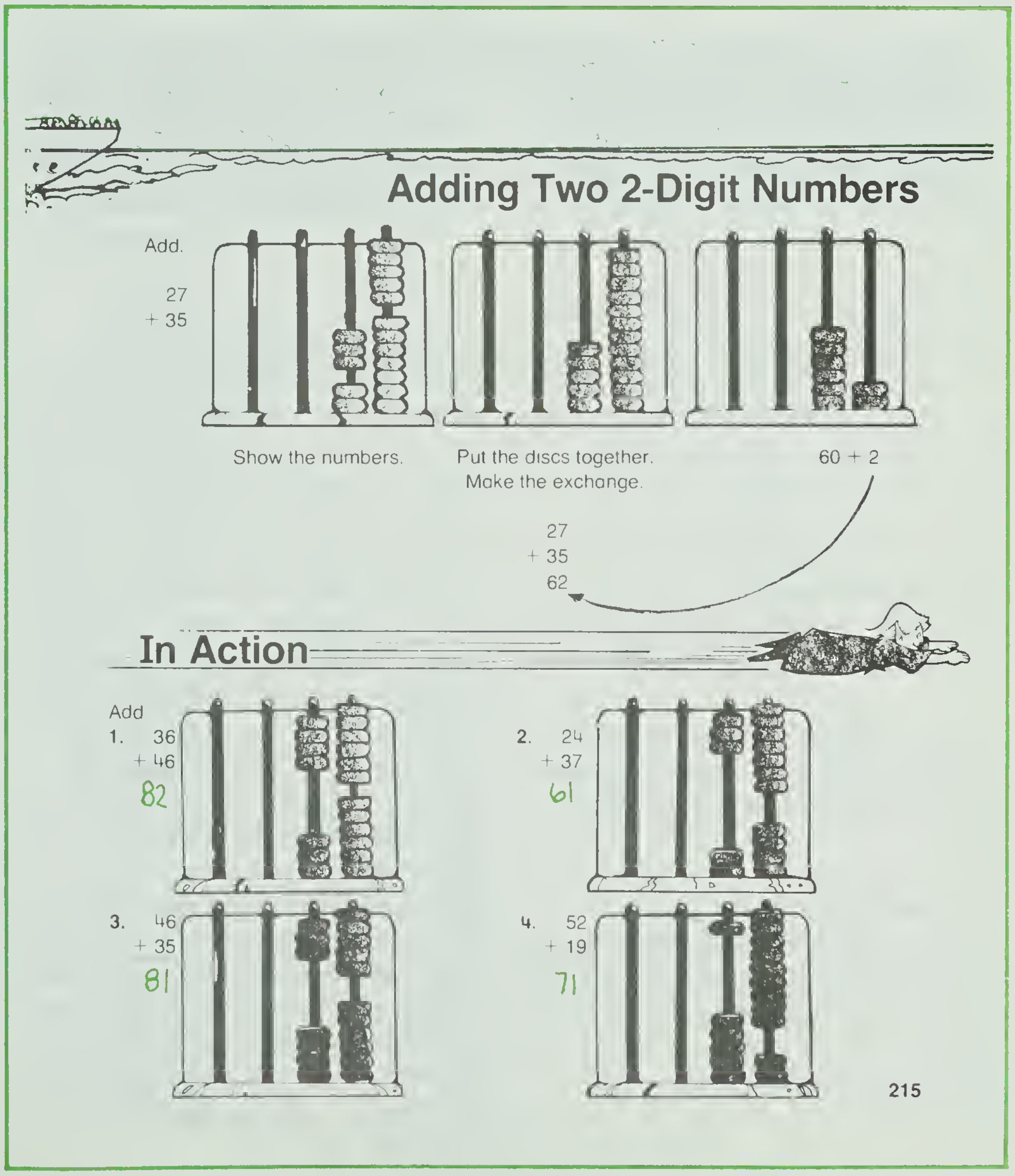
Write on the easel an addition question that requires exchanging 10 ones for 1 ten.

Add.

37
+46

Have a child show the addends on an abacus, separated by pegs.





Adding Two 2-Digit Numbers

Add.

27
+ 35

Show the numbers.

Put the discs together.
Make the exchange.

60 + 2

27
+ 35
62

In Action

Add

1. 36
+ 46
82

2. 24
+ 37
61

3. 46
+ 35
81

4. 52
+ 19
71

215

Have the child remove the pegs, first from the ones wire, then from the tens wire, and state the number of discs on the ones wire.

Discuss the operation required when the digit in the ones place is greater than nine, eliciting from the children what they remember about exchanging tens and ones. Emphasize the reason for regrouping, so that the children do not try to regroup for every addition question. Then exchange 10 discs on the ones wire for one disc on the tens wire. Ask a child to state the number of ones and the number of tens. Record the sum and have a child read it aloud.

Add.

$$\begin{array}{r} 37 \\ +46 \\ \hline 83 \end{array}$$

Repeat, using several examples that involve regrouping.

3

Write several questions on the easel, some of which require an exchange and some which do not. Provide one question for each child in the group. Appoint a child to demonstrate the first question on the abacus, telling whether the question requires making an exchange and recording the sum in the allotted place. Appoint a second child to demonstrate and record the second question. Continue in this fashion until each child has demonstrated and made a decision as to whether the addition question requires making an exchange.

4

Distribute copies of Program Master 28. Write a number of expressions on the easel, using expanded numeral form.

40 + 12

Have the children show each expression by drawing the discs on an abacus then exchange 10 ones for 1 ten and show this on another abacus. Children write the numeral in standard form underneath.

40 + 12 = 52

Written and Other Activities

☐

mathways 3, page 215

Discuss the example. Have the children show the question on their own abaci. Ask children to explain why the exchange was necessary and describe how it was done. Then have the children turn to page 131 in their *mathways 3* texts and demonstrate several of the questions that appear there.

☐ ☐

Have the children use an abacus to show several of the questions on *mathways 3* pages 120, 122 and 124. Have them explain why no exchange was necessary in each case.

☐ ☐ ☐

Groups of four children can play the following game:

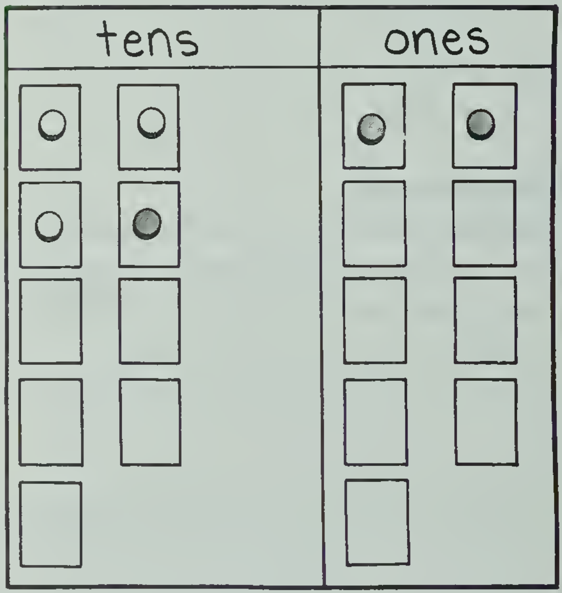
Each player is given an abacus. Then, to determine the order of play, each player draws a card from a box containing numeral cards marked 0 to 9, and keeps it until all the players have drawn a card. The player who drew the card with the greatest number goes first, the player who drew the second greatest number goes second and so on. The numeral cards are then returned to the box. Each player, in turn, draws a card, shows the number on the card on an abacus, and returns the card to the box. When all the players have a number showing on their respective abaci, they draw again, this time adding the number of discs shown by the new number and counting aloud. For example, if a player draws a 6 and the abacus shows 7, the player moves discs in the ones column, counting

Eight, nine, ten.

At that point the player exchanges the 10 ones for 1 ten and continues counting and moving discs on the ones wire, saying *eleven, twelve, thirteen.* The players continue to draw cards and add discs in this fashion until one abacus – that of the winner – shows 99.

☐ ☐ ☐ ☐

Have groups of four children play the game described in activity ☐ ☐ ☐, using a copy of the stencil illustrated. Each player shows her or his score by placing markers in the rectangles. This chart shows a score of 42.



Unit 3 Section 5 Lesson 4

Using Expanded Numerals to Make an Exchange

Materials

- for each child
  - – copy of stencil *see* ☐ ☐

Lesson

1

Gather the children around the easel. Write an addition question that does not involve regrouping.

Add.

$\begin{array}{r} 14 \\ +42 \\ \hline \end{array}$

Then ask a child to state the number of tens and the number of ones and write the expanded numeral on the easel.

Add.

$\begin{array}{r} 14 \\ +42 \\ \hline \end{array} \qquad \begin{array}{r} 10+4 \\ 40+2 \\ \hline 50+6 \end{array}$

Then have a child write the sum in the standard form.

Add.

$\begin{array}{r} 14 \\ +42 \\ \hline 56 \end{array} \qquad \begin{array}{r} 10+4 \\ 40+2 \\ \hline 50+6 \end{array}$

Repeat, using several other questions that do not require regrouping.

2

Write on the easel an expanded numeral that requires regrouping.

30 + 17

Discuss the necessity for regrouping, eliciting explanations from the children. Invite a child to write the standard numeral on the easel.

30 + 17 = 47

Repeat two or three times. Then write another expanded numeral that requires regrouping on the easel.

30 + 14

Ask the children to mentally exchange 10 ones for 1 ten and state the sum. Have a child write the standard numeral on the easel.

30 + 14 = 44

Repeat several times, each time asking the children to mentally regroup tens and ones.

3

Write the following questions on the easel, leaving room for the expanded numerals:

1. $\begin{array}{r} 65 \\ +24 \\ \hline \end{array}$	2. $\begin{array}{r} 46 \\ +50 \\ \hline \end{array}$	3. $\begin{array}{r} 18 \\ +36 \\ \hline \end{array}$
4. $\begin{array}{r} 69 \\ +25 \\ \hline \end{array}$	5. $\begin{array}{r} 70 \\ +10 \\ \hline \end{array}$	6. $\begin{array}{r} 11 \\ +23 \\ \hline \end{array}$
7. $\begin{array}{r} 22 \\ +32 \\ \hline \end{array}$	8. $\begin{array}{r} 32 \\ +48 \\ \hline \end{array}$	9. $\begin{array}{r} 30 \\ +15 \\ \hline \end{array}$

Ask different children to say whether each question referred to requires an exchange. Then have the child write the sum. If the question requires an exchange have the child write the expanded form of each addend.

Written and Other Activities

☐

mathways 3, page 216

Discuss the examples, and have children explain the expanded form.

Assign the In Action questions.

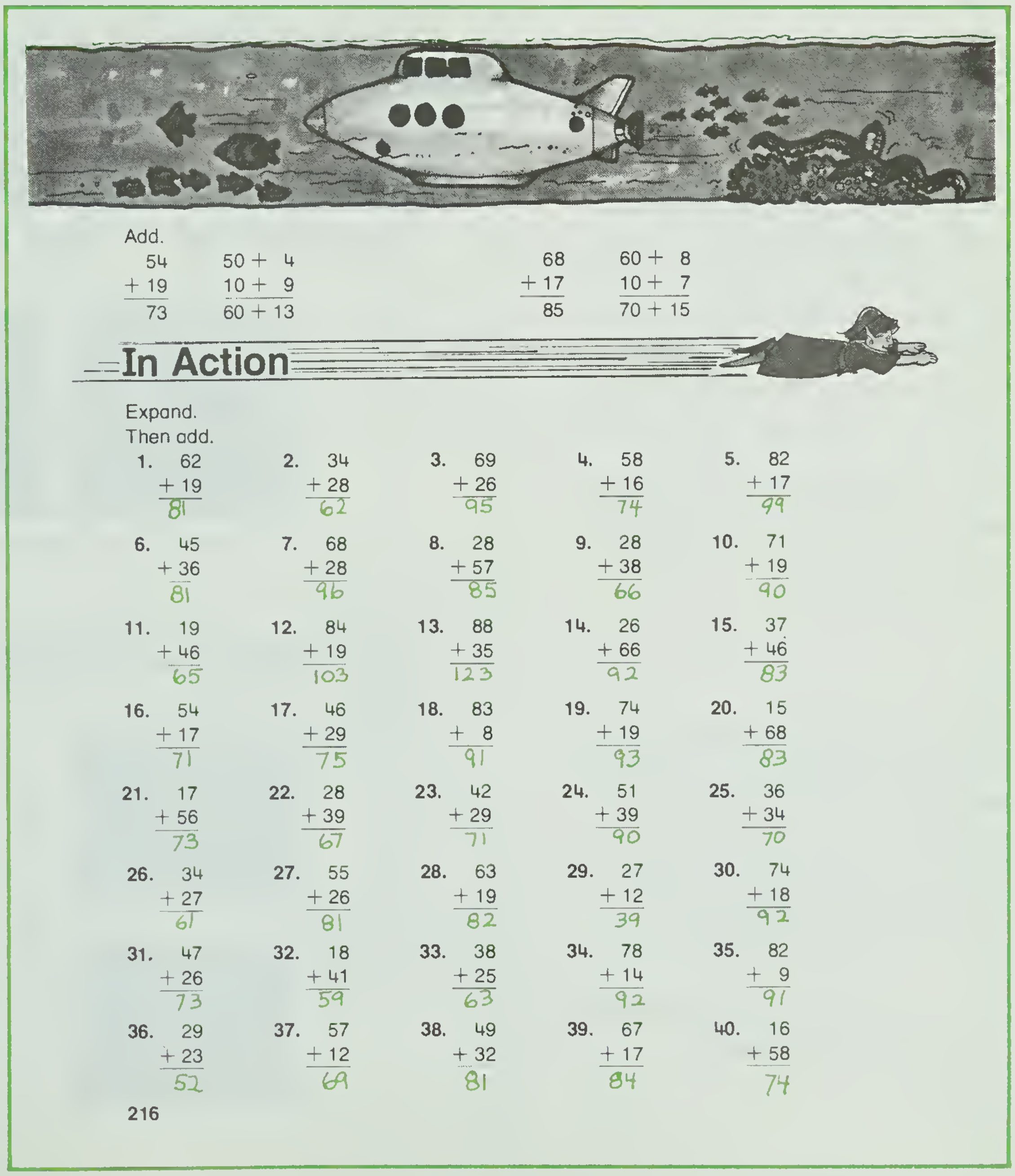
☐ ☐

Prepare and distribute copies of a stencil such as the following:

1. 40 + 11
2. 80 + 15
3. 50 + 12
4. 20 + 16
5. 60 + 17
6. 30 + 18
7. 70 + 10
8. 50 + 11
9. 70 + 14
10. 80 + 18
11. 60 + 13
12. 10 + 10
13. 20 + 12
14. 40 + 15
15. 10 + 10
16. 50 + 16
17. 10 + 14
18. 60 + 10
19. 20 + 13
20. 30 + 17

☐ ☐ ☐

mathways 3 Plus Workbook pages 71 and 72



Add.

$\begin{array}{r} 54 \\ +19 \\ \hline 73 \end{array} \qquad \begin{array}{r} 50+\ 4 \\ 10+\ 9 \\ \hline 60+13 \end{array} \qquad\qquad \begin{array}{r} 68 \\ +17 \\ \hline 85 \end{array} \qquad \begin{array}{r} 60+\ 8 \\ 10+\ 7 \\ \hline 70+15 \end{array}$

In Action

Expand.
Then add.

1. $\begin{array}{r} 62 \\ +19 \\ \hline 81 \end{array}$	2. $\begin{array}{r} 34 \\ +28 \\ \hline 62 \end{array}$	3. $\begin{array}{r} 69 \\ +26 \\ \hline 95 \end{array}$	4. $\begin{array}{r} 58 \\ +16 \\ \hline 74 \end{array}$	5. $\begin{array}{r} 82 \\ +17 \\ \hline 99 \end{array}$
6. $\begin{array}{r} 45 \\ +36 \\ \hline 81 \end{array}$	7. $\begin{array}{r} 68 \\ +28 \\ \hline 96 \end{array}$	8. $\begin{array}{r} 28 \\ +57 \\ \hline 85 \end{array}$	9. $\begin{array}{r} 28 \\ +38 \\ \hline 66 \end{array}$	10. $\begin{array}{r} 71 \\ +19 \\ \hline 90 \end{array}$
11. $\begin{array}{r} 19 \\ +46 \\ \hline 65 \end{array}$	12. $\begin{array}{r} 84 \\ +19 \\ \hline 103 \end{array}$	13. $\begin{array}{r} 88 \\ +35 \\ \hline 123 \end{array}$	14. $\begin{array}{r} 26 \\ +66 \\ \hline 92 \end{array}$	15. $\begin{array}{r} 37 \\ +46 \\ \hline 83 \end{array}$
16. $\begin{array}{r} 54 \\ +17 \\ \hline 71 \end{array}$	17. $\begin{array}{r} 46 \\ +29 \\ \hline 75 \end{array}$	18. $\begin{array}{r} 83 \\ +\ 8 \\ \hline 91 \end{array}$	19. $\begin{array}{r} 74 \\ +19 \\ \hline 93 \end{array}$	20. $\begin{array}{r} 15 \\ +68 \\ \hline 83 \end{array}$
21. $\begin{array}{r} 17 \\ +56 \\ \hline 73 \end{array}$	22. $\begin{array}{r} 28 \\ +39 \\ \hline 67 \end{array}$	23. $\begin{array}{r} 42 \\ +29 \\ \hline 71 \end{array}$	24. $\begin{array}{r} 51 \\ +39 \\ \hline 90 \end{array}$	25. $\begin{array}{r} 36 \\ +34 \\ \hline 70 \end{array}$
26. $\begin{array}{r} 34 \\ +27 \\ \hline 61 \end{array}$	27. $\begin{array}{r} 55 \\ +26 \\ \hline 81 \end{array}$	28. $\begin{array}{r} 63 \\ +19 \\ \hline 82 \end{array}$	29. $\begin{array}{r} 27 \\ +12 \\ \hline 39 \end{array}$	30. $\begin{array}{r} 74 \\ +18 \\ \hline 92 \end{array}$
31. $\begin{array}{r} 47 \\ +26 \\ \hline 73 \end{array}$	32. $\begin{array}{r} 18 \\ +41 \\ \hline 59 \end{array}$	33. $\begin{array}{r} 38 \\ +25 \\ \hline 63 \end{array}$	34. $\begin{array}{r} 78 \\ +14 \\ \hline 92 \end{array}$	35. $\begin{array}{r} 82 \\ +\ 9 \\ \hline 91 \end{array}$
36. $\begin{array}{r} 29 \\ +23 \\ \hline 52 \end{array}$	37. $\begin{array}{r} 57 \\ +12 \\ \hline 69 \end{array}$	38. $\begin{array}{r} 49 \\ +32 \\ \hline 81 \end{array}$	39. $\begin{array}{r} 67 \\ +17 \\ \hline 84 \end{array}$	40. $\begin{array}{r} 16 \\ +58 \\ \hline 74 \end{array}$

216

Unit 3 Section 5 Lesson 5

Showing Subtraction that Requires Regrouping on the Abacus

Materials

- for each child
  - abacus
  - copy of Program Master 28
- for groups of four children
  - four abaci
  - set of numeral cards, 0 to 9
  - box
  - blue die marked 1, 1, 2, 2, 3, 3 to represent tens
  - red die marked 4 to 9 to represent ones

Lesson

1

Gather the children around the easel and distribute the abaci, giving one to each child. Write on the easel

Subtract.

47
−26

Have the children show 47 on the abacus, then take away 6 ones and 2 tens to show the subtraction. Discuss the difference in using the abacus for addition and subtraction, eliciting from children that both numbers are shown for addition because addition means joining sets. For subtraction, only the first number is shown on the abacus, since subtraction means taking a set of objects away from the first set.

Have a child record the difference shown on the abacus. Remind the child to record the ones before recording the tens.

47
−26
21

Repeat, using other examples that do not require regrouping, each time having the children show the subtraction on the abacus. Include questions that have zero ones in the minuend and subtrahend, for example, 70 − 20 and 65 − 30.

2

Write a subtraction question involving regrouping on the easel.

Subtract.

52
−27

Have the children show the minuend on the abacus.

Ask

How can we subtract 7 ones from 2 ones?

Can we make an exchange, Barry? How?

Have the child demonstrate the exchange, removing one disc from the tens wire and adding 10 discs to the ones wire.

Have all the children follow suit. Then have the children remove seven discs from the ones wire and two discs from the tens wire to show the subtraction. Record the difference shown on the abacus.

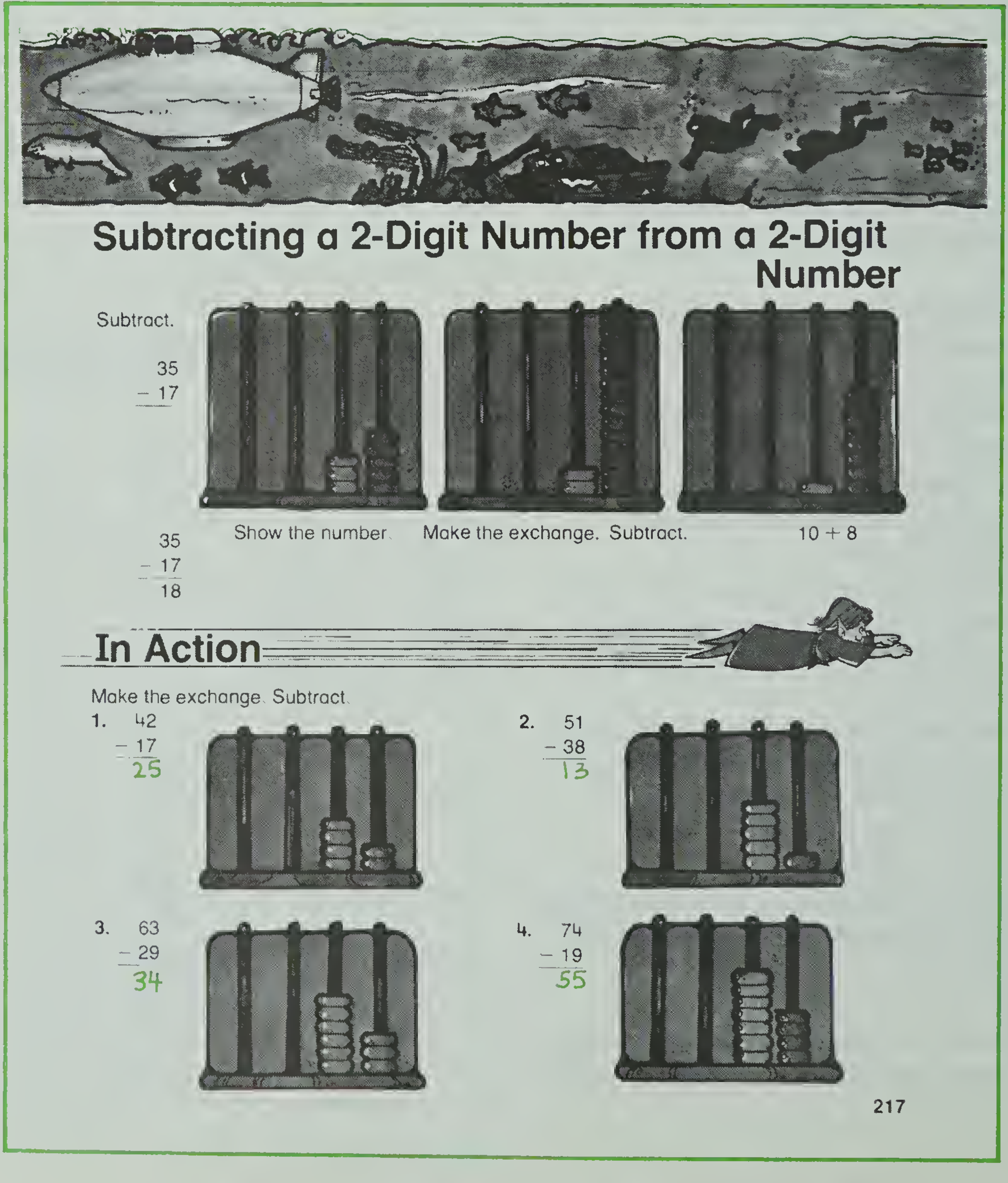
Subtract.

52
−27
25

Repeat several times, using questions that require regrouping and having the children show each exchange and subtraction on the abacus. Include examples with zero ones, such as 50 − 24.

3

Write on the easel a number of questions that do and do not involve regrouping, some of which require subtracting a one-digit from a two-digit number. Provide one question for each child in the group. Referring to a question, ask a child to state whether it will require



Subtracting a 2-Digit Number from a 2-Digit Number

Subtract.

35
− 17

Show the number. Make the exchange. Subtract. 10 + 8

35
− 17
18

In Action

Make the exchange. Subtract.

1. 42 − 17 = 25
2. 51 − 38 = 13
3. 63 − 29 = 34
4. 74 − 19 = 55

regrouping and to explain why. Then have the child show the subtraction on the abacus as each child in the group similarly shows the subtraction. Discuss how the same question would be shown on a place-value mat. Have a child draw a place-value mat on the easel and show the steps involved. Compare the two methods of showing subtraction, asking each child in the group to tell which method they prefer and explain why. Repeat until each child has explained the necessity for making an exchange or the lack of it, and has demonstrated on the abacus. Several times during the activity, invite children to show the same question on a place-value mat drawn on the easel.

4

Invite groups of four children to play the following game, giving each group the required materials. Each player takes an abacus. Then, to determine the order of play, each player draws a card from a box containing numeral cards marked 0 to 9, and keeps it until all the players have drawn a card. The player who drew the card showing the greatest number plays first, the player holding the next greatest number plays second, and so on. The numeral cards are then returned to the box. Then each player arranges discs on the abacus to show 99. The first player draws a numeral card from the box and subtracts the number of discs indicated. The first player to reach zero on the abacus is the winner.

5

Give each group of four players dice marked 0 to 5, and 4 to 9. All the players arrange discs on their abaci to show 99. Then, each player in turn tosses the dice and subtracts the indicated number of discs from the abacus, counting aloud and regrouping as necessary. The first player to show zero on the abacus is the winner. If a child rolls a number greater than the number left on her or his abacus, it should be considered an "out".

Written and Other Activities

☐

mathways 3, page 217

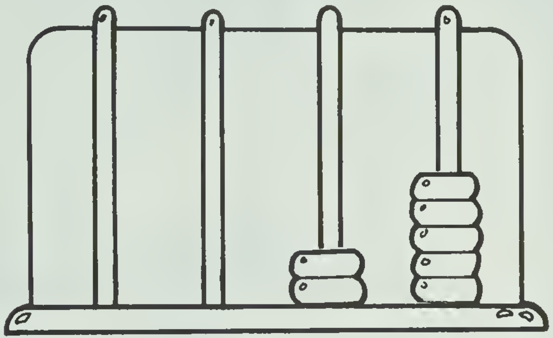
Discuss each step in the example, comparing the numerals and the corresponding illustration. Have the children show the example on their abaci before assigning the In Action questions.

☐ ☐

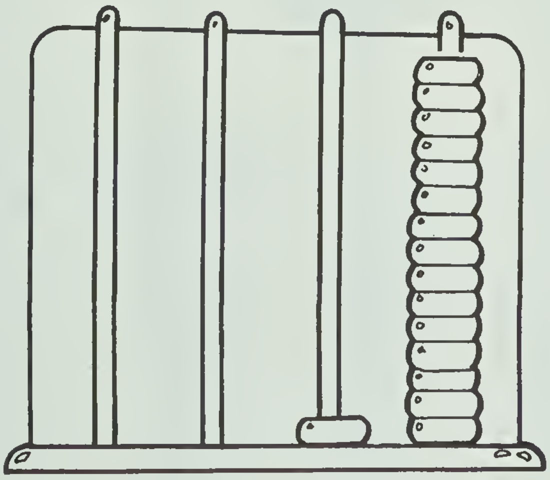
Distribute copies of Program Master 28 and write on the easel

1. 25
2. 43
3. 55
4. 61
5. 97
6. 50
7. 72
8. 84
9. 20
10. 36

Have the children draw discs on two abaci for each number. The first abacus shows the numeral and the second shows a ten regrouped as 10 ones.



25



25

☐ ☐ ☐

Have the children illustrate the subtraction questions on *mathways 3* page 217 in two of the following ways:

- on a 100-chart
- on a number line
- by gluing 10-strips and unit strips onto a place-value chart.

☐ ☐ ☐ ☐

Review the relation between addition and subtraction, and have the children check some of the questions on page 217 by adding. Have them demonstrate the additions on their abaci.

Unit 3 Section 5 Lesson 6

Using Expanded Numerals for Subtraction Requiring an Exchange

Materials

- for each child
  - abacus

Lesson

1

Gather the children around the easel. Write on the easel

Subtract.

49
−12

Invite a child to write the numerals in expanded form on the easel.

Subtract.

40 + 9
10 + 2

Invite a child to complete the subtraction.

Subtract.

40 + 9 49
10 + 2 −12
30 + 7 37

Repeat, using several examples that do not require regrouping. Include minuends and subtrahends with zero ones, such as 60 − 30 and 58 − 20.

2

Write a standard numeral on the easel.

68

Call for a volunteer to write the expanded form on the easel.

68 60 + 8

Ask

If we exchange a ten for 10 ones, how would we write the numeral to show what we have done?

Have a child write *50 + 18.*

2

Write a standard numeral on the easel, saying

Who can write this numeral in a way that will show that 10 ones have been exchanged for a ten?

Have a child write *37 20 + 17*

Repeat several times, encouraging the children to omit the step of writing the original expanded numeral. Then write a subtraction question in which an exchange is necessary.

Subtract.

51
−16

Explaining the steps, rewrite the question.

Subtract.

51 40 + 11
−16 10 + 6
35 30 + 5

Repeat several times. Include examples of subtracting a one-digit number from a two-digit number.

Written and Other Activities

☐

mathways 3, page 218

Before assigning the In Action questions, have children describe in their own words the steps involved in the examples and the reason for making the exchanges. Emphasize that the value of an expanded numeral before and after an exchange has been made remains the same.

☐ ☐

Write 20 numbers on the easel, using standard form. Have the children write each number in expanded form to show that a ten has already been exchanged for 10 ones. Then, when the children have completed the task and it has been discussed, have the children show several of the expanded numerals on the abacus.

☐ ☐ ☐

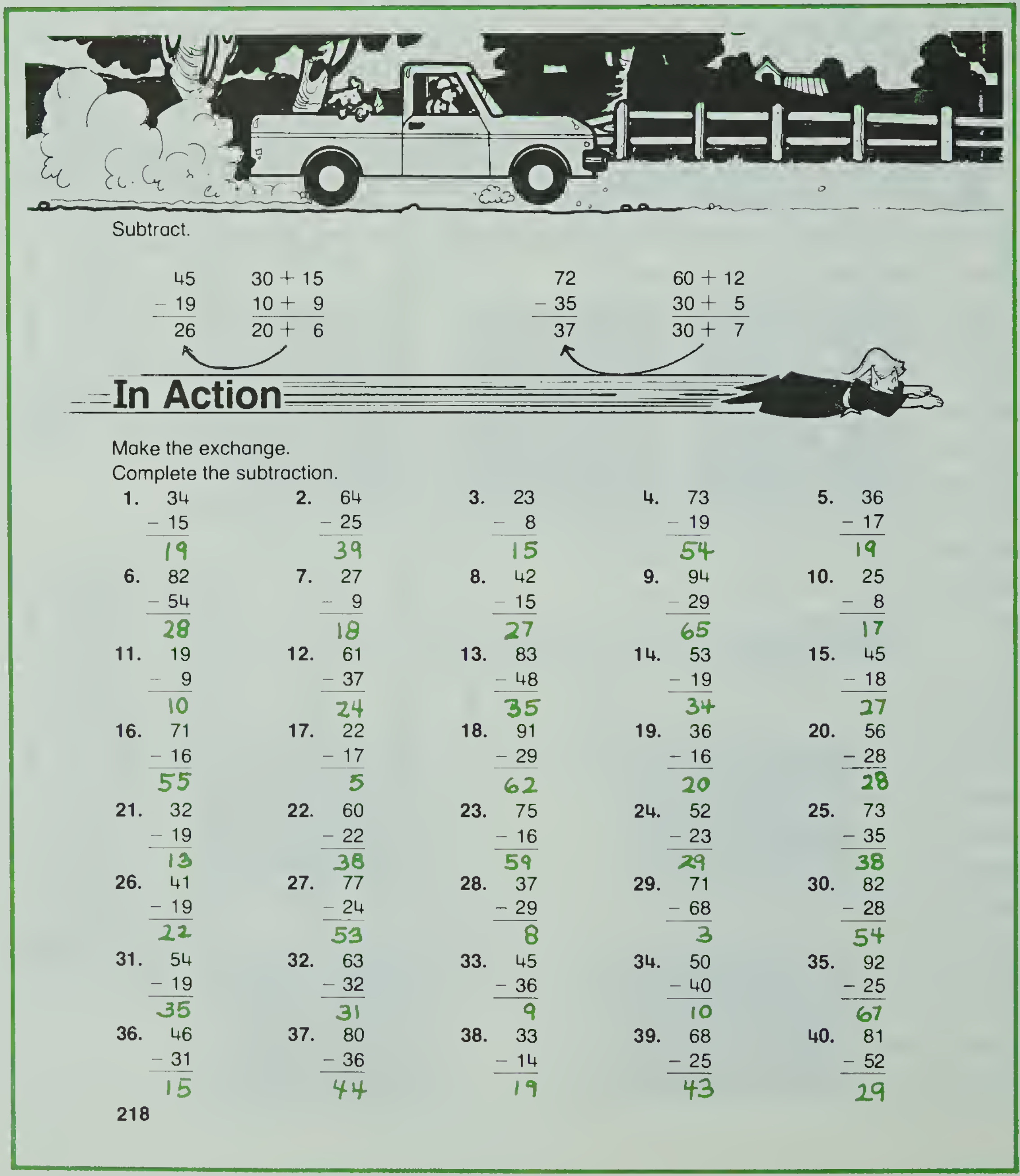
mathways 3 Practice Masters page 48

☐ ☐ ☐ ☐

mathways 3 Tests 2A, 2B

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 73 and 74



Subtract.

45 30 + 15
− 19 10 + 9
26 20 + 6

72 60 + 12
− 35 30 + 5
37 30 + 7

In Action

Make the exchange.
Complete the subtraction.

1. 34 − 15 19	2. 64 − 25 39	3. 23 − 8 15	4. 73 − 19 54	5. 36 − 17 19
6. 82 − 54 28	7. 27 − 9 18	8. 42 − 15 27	9. 94 − 29 65	10. 25 − 8 17
11. 19 − 9 10	12. 61 − 37 24	13. 83 − 48 35	14. 53 − 19 34	15. 45 − 18 27
16. 71 − 16 55	17. 22 − 17 5	18. 91 − 29 62	19. 36 − 16 20	20. 56 − 28 28
21. 32 − 19 13	22. 60 − 22 38	23. 75 − 16 59	24. 52 − 23 29	25. 73 − 35 38
26. 41 − 19 22	27. 77 − 24 53	28. 37 − 29 8	29. 71 − 68 3	30. 82 − 28 54
31. 54 − 19 35	32. 63 − 32 31	33. 45 − 36 9	34. 50 − 40 10	35. 92 − 25 67
36. 46 − 31 15	37. 80 − 36 44	38. 33 − 14 19	39. 68 − 25 43	40. 81 − 52 29

218

Unit 3 Section 5 Lesson 7

Solving Word Problems: Reading and Making Maps

Materials

- metre stick

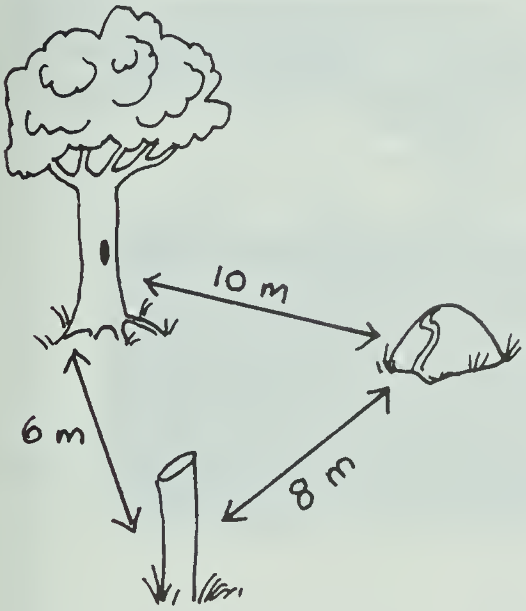
Lesson

1

Gather the children around the working area. Ask several children to estimate the length of one metre, marking the estimate on the floor. Show the metre stick and discuss briefly the calibrations, eliciting from the children what they remember about it. Then have children check the estimates by measuring. Write the symbol *1* m on the easel and have a child read it aloud.

2

Draw the following map showing distances on the easel, explaining as you draw:



Ask for the distance from the tree to the post, from the rock to the tree, and from the rock to the post. Then pose the following problem:

Sue ran from the tree to the post and then from the post to the rock. How far did she run?

Ask a child to point out this path on the map and write the distances on the easel as an addition question. Have the child add to find the distance. Write the answer on the easel in full sentence form.

Sue ran a total distance of 14 m.

Pose several similar problems and involve other children in finding the solutions.

Written and Other Activities

☐

mathways 3, page 219

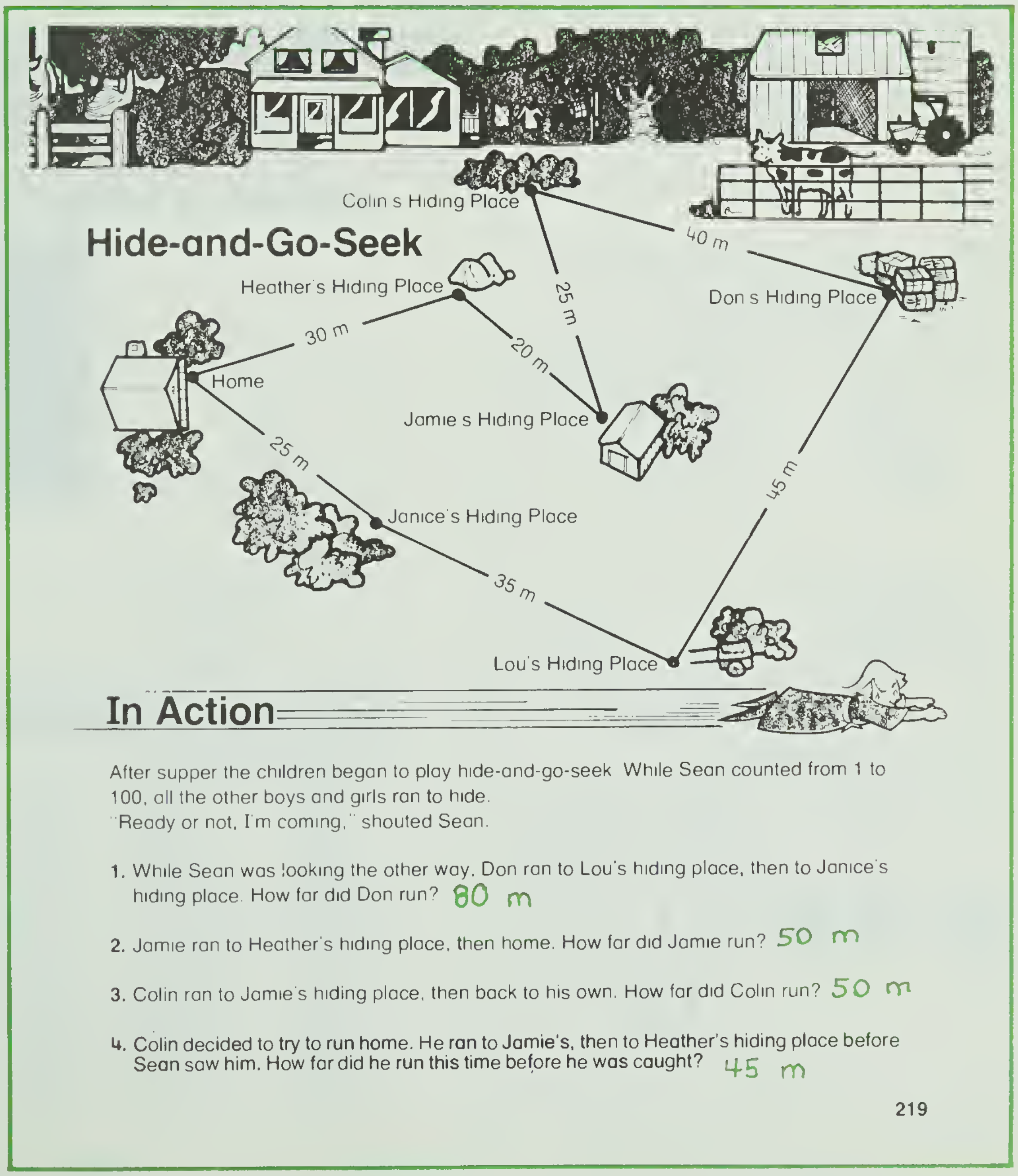
Discuss the map, asking children to read the locations and the distances. Invite children to explain the rules for Hide-and-Go-Seek. Then have children read each of the In Action problems aloud and rephrase each in their own words.

☐ ☐

Invite the children to draw their own maps, label and decorate them, provide a title and write four problems about distances. Encourage the children to work in pairs for this activity. When the maps and problems have been completed, have the children attach the problems to the maps and display them in the classroom. Have each child select three maps, write the title of each, and under each title, answer the attached questions.

☐ ☐ ☐

mathways 3 Plus Workbook page 75



Hide-and-Go-Seek

In Action

After supper the children began to play hide-and-go-seek. While Sean counted from 1 to 100, all the other boys and girls ran to hide.
"Ready or not, I'm coming," shouted Sean.

1. While Sean was looking the other way, Don ran to Lou's hiding place, then to Janice's hiding place. How far did Don run? 80 m
2. Jamie ran to Heather's hiding place, then home. How far did Jamie run? 50 m
3. Colin ran to Jamie's hiding place, then back to his own. How far did Colin run? 50 m
4. Colin decided to try to run home. He ran to Jamie's, then to Heather's hiding place before Sean saw him. How far did he run this time before he was caught? 45 m

219

Unit 3 Section 6 Lesson 1

Using Standard and Expanded Numerals to Add Three-Digit Numbers

Materials

- for each child
  - place-value mat
  - nine of each of the following: 100-flats, 10-strips, unit strips, reproduced from Program Masters 19 and 20
  - copy of Program Master 28

Rationale

Using the expanded form for adding three-digit numbers helps clarify the place value of standard numerals and prepares the children to use expanded numerals for addition questions that require regrouping in the lessons that follow.

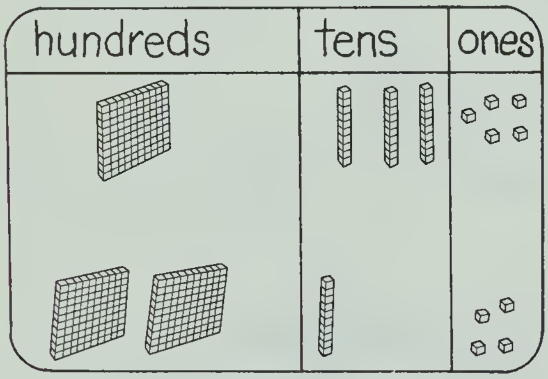
Lesson

1

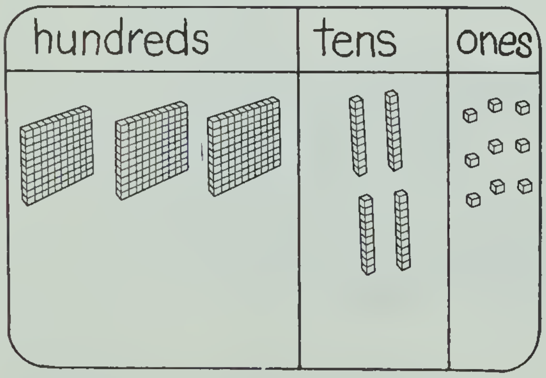
Gather the children around the easel and distribute the place-value material and mats. Write an addition question that does not require regrouping.

Add.
135
+214

Have the children show 135, then 214 on their place-value mats.



Have the children combine the materials on their mats.



Record the sum.

Add.
135
+214
349

Repeat, using several other addition questions that do not require regrouping.

2

Write an addition question on the easel. Have children show the addends on their place-value mats, then write the expanded form of the addends, the sum for the expanded form, and the sum for the standard form.

Add.

260	*200 + 60 + 0*
+716	*700 + 10 + 6*
976	*900 + 70 + 6*

Repeat, using several other examples that do not involve regrouping and giving all the children an opportunity to participate.

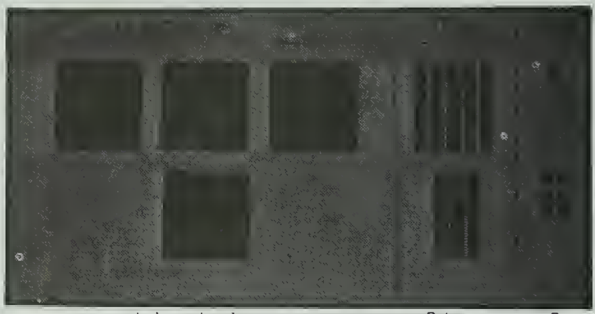
3

Write an addition question on the easel and have the children add without using expanded numerals or place-value materials.

Add.
452
+307
759

Repeat several times.

Addition of 3-Digit Numbers

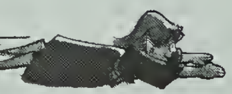


Add.
352
+ 136
488

You can write your addition question 2 ways.

Add.
352 | 300 + 50 + 2
+ 136 | 100 + 30 + 6
| 400 + 80 + 8
or
488

Add.
352
+ 136
488



In Action

Add. Use the expanded form.

1. 527
+ 231
758

2. 463
+ 215
678

3. 703
+ 291
994

4. 624
+ 152
776

5. 377
+ 211
588

6. 375
+ 123
498

7. 235
+ 532
767

8. 325
+ 413
738

9. 602
+ 115
717

10. 421
+ 538
959

Add. Use the short form.

11. 184
+ 213
397

12. 611
+ 236
847

13. 123
+ 321
444

14. 426
+ 152
578

15. 456
+ 123
579

16. 380
+ 308
688

17. 753
+ 222
975

18. 263
+ 324
587

19. 358
+ 121
479

20. 400
+ 156
556

Written and Other Activities

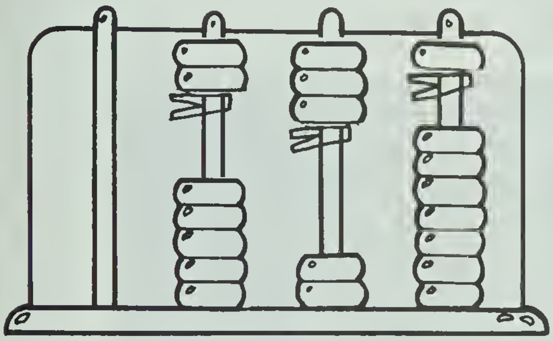
☐

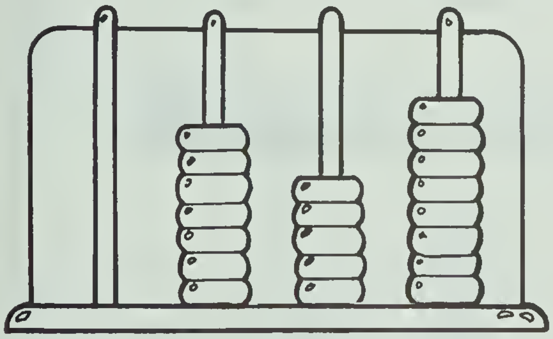
mathways 3, page 220

Discuss the example, stressing the equivalence in value between the standard and expanded forms of the numerals and their place-value meaning. Assign the In Action questions.

☐ ☐

Distribute copies of Program Master 28, on which appear several abaci. Have the children illustrate several of the questions on *mathways 3* page 220 by drawing discs and pegs to show each addend. Instruct them to show the top addend first, then the second, and then draw the combined number of discs to show the sum on a second abacus, and underneath, write the question.





527
+231
758

☐ ☐ ☐

Have the children draw two pictures to illustrate each of five questions on *mathways 3* page 220. The first picture shows materials arranged to represent both addends, and the second picture shows the materials combined.

☐ ☐ ☐ ☐

Ask the children to write story problems for three or four of the addition questions on page 220 of *mathways 3.*

There were 527 books on the west wall of the library.
There were 231 books on the east wall of the library.
How many books were on those two walls?

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 76

For Your Notes

Unit 3 Section 6 Lesson 2

Exchanging 10 Ones for 1 Ten

Materials

- place-value mat and materials
- for each child
  - nine 100-flats, nine 10 strips and 18 unit strips
  - abacus
  - place-value chart

Lesson

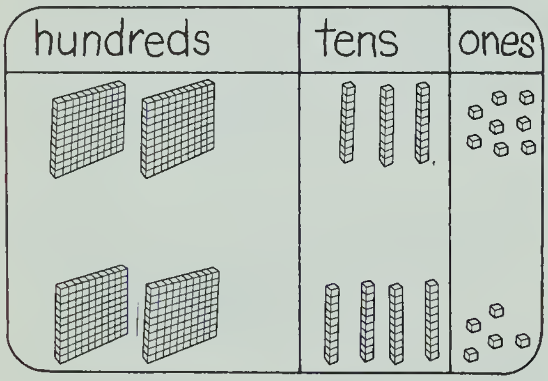
1

Gather the children around the easel and distribute the place-value mats and materials. Record an addition question that requires an exchange.

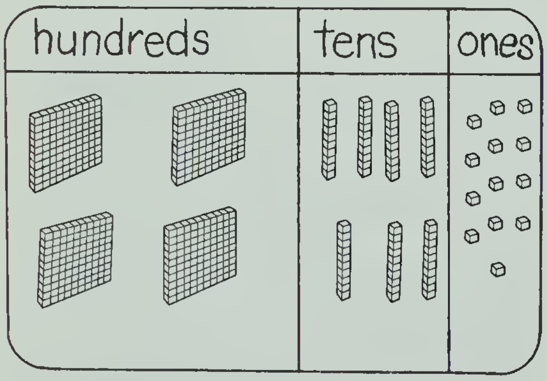
Add.

238
+245

Illustrate both addends with the place-value materials, and have the children illustrate them on their mats.

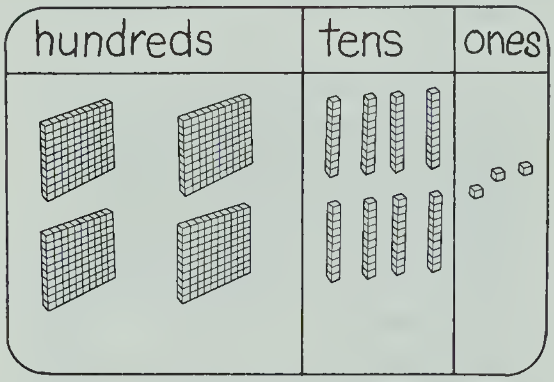


Have the children combine the materials.



Ask children to state the number of ones, tens and hundreds. Ask *Since there are more than nine unit strips in the ones section, what must we do?*

Have a child demonstrate the exchange on the place-value mat as the other children follow suit. Emphasize that 4 hundreds, 7 tens and 13 names the same number as 4 hundreds, 8 tens and 3.



Ask a child to state the number of ones, tens and hundreds and record the sum.

Add.

238
+245
483

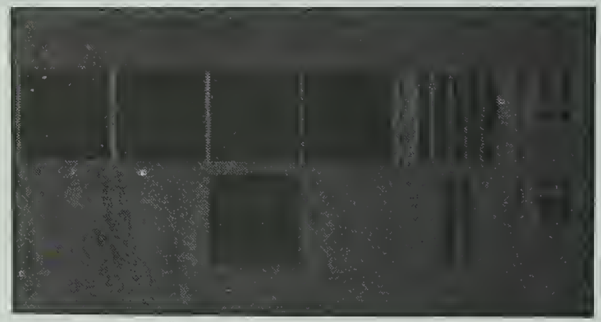
Repeat until the children have illustrated each step of several similar questions with their place-value materials.

2

Have the children copy the following expanded numerals from the easel:

1. 300 + 10 + 12
2. 800 + 80 + 14
3. 600 + 40 + 17
4. 200 + 60 + 13
5. 500 + 50 + 17

Exchanging 10 Ones for 1 Ten



Add.
You can use the expanded form.

456 400 + 50 + 6
+ 126 100 + 20 + 6
582 500 + 70 + 12

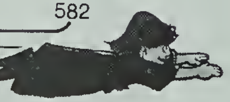
or

500 + 80 + 2
or
582

5 hundreds 7 tens 12

Exchange 10 ones for 1 ten.

5 hundreds 8 tens 2
or
582



In Action

Add. Use the expanded form.

1. 126 + 137 263	2. 517 + 277 794	3. 316 + 425 741	4. 219 + 136 355	5. 529 + 163 692
6. 237 + 156 393	7. 717 + 259 976	8. 816 + 116 932	9. 638 + 215 853	10. 722 + 159 881
11. 328 + 415 743	12. 644 + 148 792	13. 154 + 119 273	14. 844 + 109 953	15. 662 + 118 780
16. 435 + 128 563	17. 748 + 139 887	18. 516 + 206 722	19. 329 + 423 752	20. 632 + 218 850

6. 100 + 30 + 18
7. 300 + 70 + 10
8. 400 + 20 + 16
9. 900 + 50 + 11
10. 700 + 60 + 15

Instruct the children to write the expanded form after an exchange of 1 ten for 10 ones has been made, and beneath it, the standard numeral.

For example
300 + 10 + 12
300 + 20 + 2
322

3

Write an addition question with three-digit addends on the easel and have a child write the expanded numeral for each addend.

Add.
$$\begin{array}{rl} 369 & \quad 300 + 60 + 9 \\ \underline{+125} & \quad \underline{100 + 20 + 5} \end{array}$$

Have another child record the sum in the expanded form.

Since there are more than 9 ones in the ones column, what must we do? Will you show us please, Rene?

Make the exchange and record the sum in the standard form, indicating the exchange in the following manner:

Add.
$$\begin{array}{r} 369 \\ +125 \\ \hline 494 \end{array}$$

$$\begin{array}{l} 300 + 60 + 9 \\ 100 + 20 + 5 \\ \hline 400 + 80 + 14 \\ \quad\quad \text{or} \\ 400 + 90 + 4 \end{array}$$

Repeat, using examples that require an exchange each time and involving children in performing each step, including the step of recording the exchange and standard numeral on the easel, and drawing the arrows to show the equivalence between the final expanded numeral and the standard numeral.

4

Pose a problem such as the following.
In March, Mr. Wells sold 125 racing car tires. In February Mr. Wells sold 117 racing car tires. How many tires did Mr. Wells sell altogether in the two months?

Ask what must be done to solve the problem. Have a child write the corresponding addition question on the easel and show each of the steps described in activity 2. Write the answer to the problem on the easel in full sentence form.

In February and March Mr. Wells sold 242 tires altogether.

Point out to the children that when they hear or read the question *How many altogether?* finding the answer requires adding numbers together. Pose other questions involving the transportation theme.

Written and Other Activities

☐

mathways 3, page 221

Discuss the example. Have children explain how the materials representing the addends are combined to show addition. Discuss the reason for the exchange and relate the materials to the expanded form of the numerals. Compare the expanded numerals to the standard numerals, stressing their equivalence. Then, solicit volunteers to do the first In Action question on the easel and explain the steps involved. Have two or three children explain how they will do the questions.

☐ ☐

Have the children show the three steps involved in answering one of the addition questions on page 221 by drawing place-value materials on a place-value mat.

☐ ☐ ☐

Give each child an abacus and have the children demonstrate one or more of the questions on *mathways 3* page 221.

For Your Notes

Unit 3 Section 6 Lesson 3

Adding Three-Digit Numbers: Exchanging 10 Tens for 1 Hundred

Materials

- for each child
  - place-value mat
  - nine 100-flats, eighteen 10-strips, nine unit strips
  - place-value chart
  - abacus
- red cube marked 1, 2, 3, 3, 4, 4
- blue cube marked 5, 5, 6, 7, 8, 9
- green cube marked 1, 2, 3, 3, 4, 4

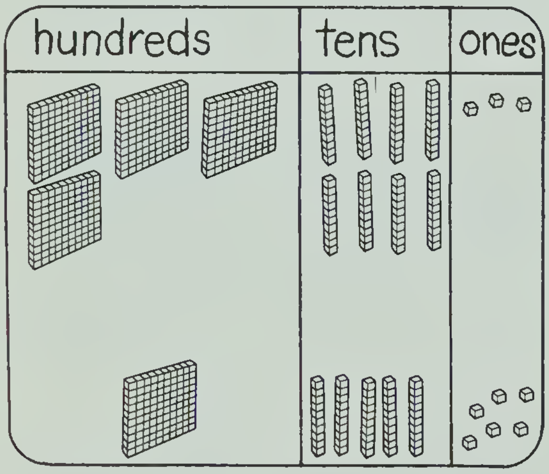
Lesson

1

Gather the children around the easel and distribute the place-value mats and materials. Write on the easel

Add.
483
+156

Illustrate both addends with place-value material on a place-value mat. Have the children show the addends on their own mats.



Combine the materials and have the children do the same. Ask whether regrouping of ones is required when there are less than 10 ones.

Have a child count the number of tens. Discuss the fact that there are more than 9 tens. Ask what 10 tens might be exchanged for. Show the exchange on the place-value mat, and have the children arrange their place-value materials accordingly. With the help of the children, determine the sum and record it in the appropriate location.

Add.
483
+156
639

Repeat, using several examples that require regrouping tens and hundreds.

2

Have the children copy the following expanded numerals from the easel:

1. *100 + 120 + 2*
2. *700 + 100 + 4*
3. *400 + 160 + 6*
4. *200 + 180 + 1*
5. *300 + 170 + 7*
6. *500 + 110 + 0*
7. *300 + 140 + 9*
8. *200 + 100 + 5*
9. *800 + 150 + 3*
10. *600 + 130 + 8*

Have the children rewrite each numeral to show that an exchange of 10 tens for 1 hundred has been made and, beneath it, the standard numeral. For example

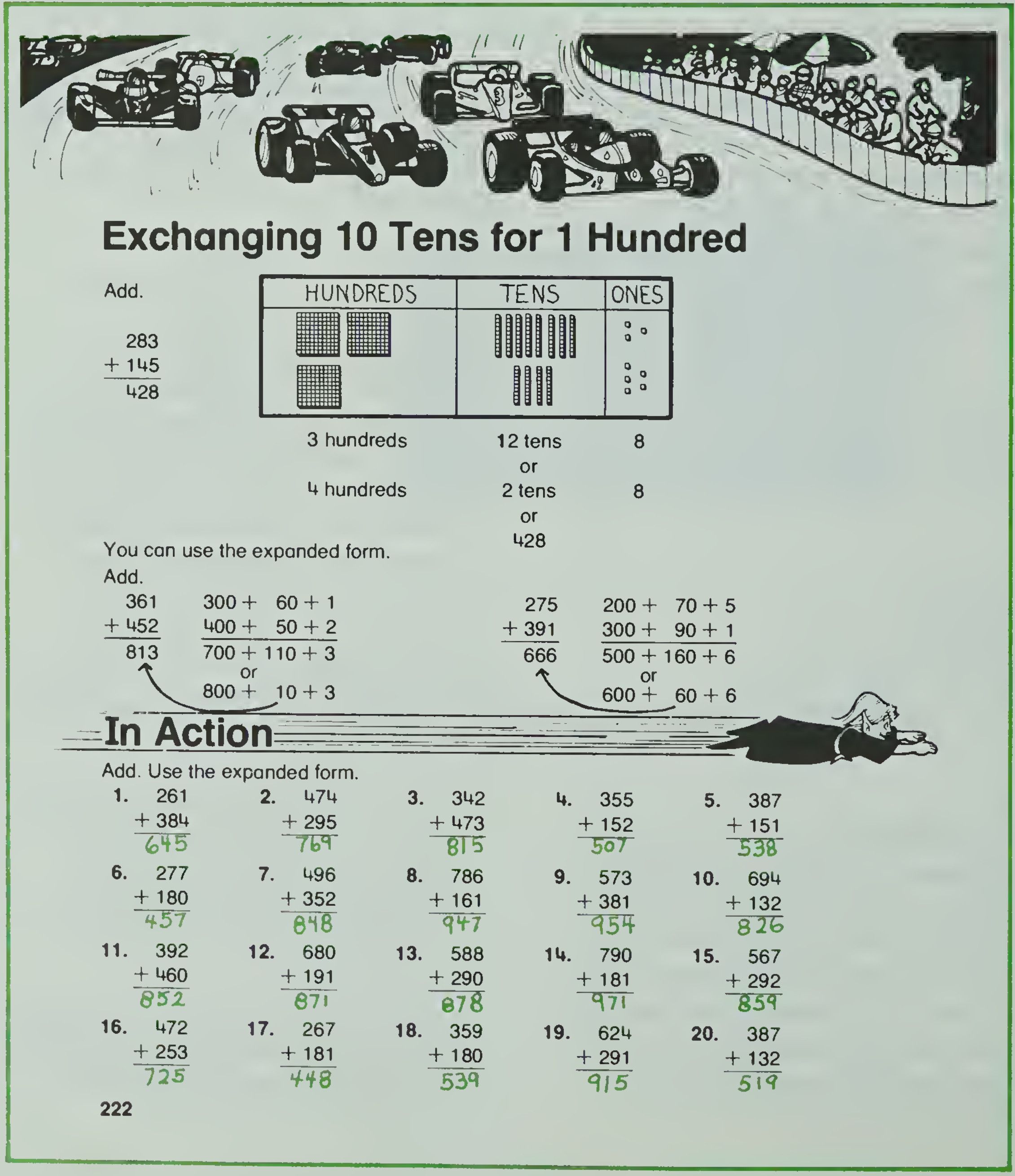
100 + 120 + 2
200 + 20 + 2
222

3

Write an addition question on the easel in two ways.

Add.
483   *400 + 80 + 3*
+156   *100 + 50 + 6*

Have a child direct you in completing the question, explaining how the exchange of 10 tens for 1 hundred should be made. Then record the



Exchanging 10 Tens for 1 Hundred

Add.

283
+ 145
428

HUNDREDS	TENS	ONES
3 hundreds	12 tens	8
	or	
4 hundreds	2 tens	8
	or	
	428	

You can use the expanded form.

Add.

361   300 + 60 + 1
+ 452   400 + 50 + 2
813   700 + 110 + 3
or
800 + 10 + 3

275   200 + 70 + 5
+ 391   300 + 90 + 1
666   500 + 160 + 6
or
600 + 60 + 6

In Action

Add. Use the expanded form.

1. 261 + 384 645	2. 474 + 295 769	3. 342 + 473 815	4. 355 + 152 507	5. 387 + 151 538
6. 277 + 180 457	7. 496 + 352 848	8. 786 + 161 947	9. 573 + 381 954	10. 694 + 132 826
11. 392 + 460 852	12. 680 + 191 871	13. 588 + 290 878	14. 790 + 181 971	15. 567 + 292 859
16. 472 + 253 725	17. 267 + 181 448	18. 359 + 180 539	19. 624 + 291 915	20. 387 + 132 519

222

numeral in standard form in the appropriate place.

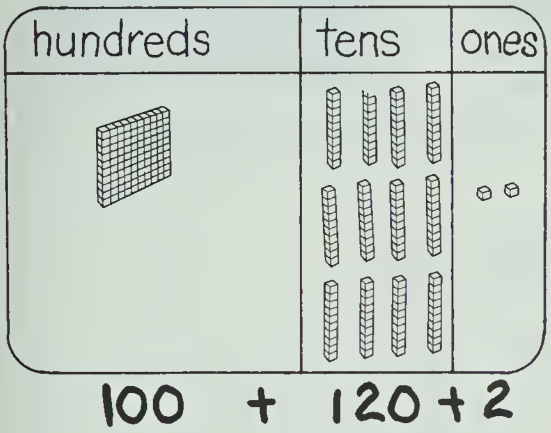
Add.

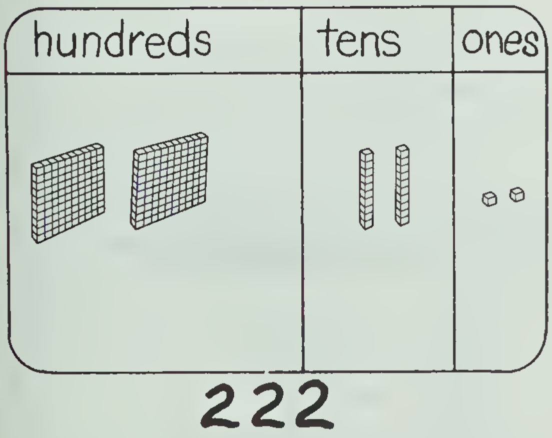
483
+156
639

400 + 80 + 3
100 + 50 + 6
500 + 130 + 9
or
600 + 30 + 9

4

Have the children show the steps involved in making the exchange for each of the exercises in activity 2 on a place value-mat.





Written and Other Activities

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mathways 3, page 222

Have the children point out the materials shown in the example and relate them to the addends, and explain how the materials are combined, then exchange to show addition. Discuss each example of expanded form, emphasizing place value and the exchange of 10 tens for 1 hundred. Assign the In Action questions.

☐ ☐

Give each child an abacus with which to demonstrate for the group the steps involved in one of the addition questions on *mathways* 3 page 222.

☐ ☐ ☐

Three children start the activity. One child is designated to always randomly state a number of hundreds between 1 hundred and 8 hundreds. A second child always randomly states 1 hundred and a number between 1 ten and 9 tens. A third child always states randomly a number of ones between 1 one and 9 ones. As the numbers are given, a fourth child records them on the easel. For example:

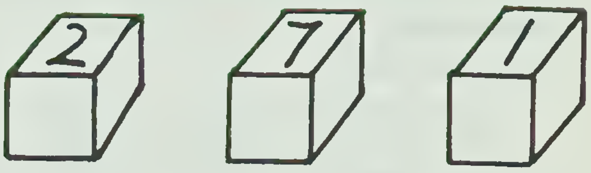
700 + 150 + 6

Ask all of the children in the group to rewrite the number showing the exchange of 10 tens for 1 hundred and then the standard numeral.

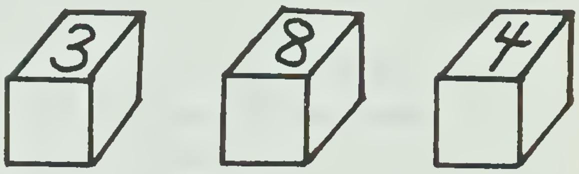
800 + 50 + 6   856

☐ ☐ ☐ ☐

Have the children use three numbered cubes: a red one representing hundreds marked with the numerals 1, 2, 3, 3, 4, 4; a blue one representing tens marked 5, 5, 6, 7, 8, 9; and a green one representing ones marked 1, 2, 3, 3, 4, 4. A child rolls the cubes, arranges them and records the numeral showing as the first addend of an addition question.



The cubes are rolled again to obtain a second addend.



Have both addends expanded and the addition completed as indicated.

Add.

271   200 + 70 + 1
+384   300 + 80 + 4
655   500 + 150 + 5
or
600 + 50 + 5

☐ ☐ ☐ ☐ ☐

mathways 3 Practice Masters page 49

☐ ☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 77

Section 6 Lesson 4

Adding Three-Digit Numbers: Making Two Exchanges

Materials

- for each child
  - – place-value mat
  - – nine 100-flats, eighteen 10-strips, 18 unit strips
  - – blank 100-chart reproduced from Program Master 21

Lesson

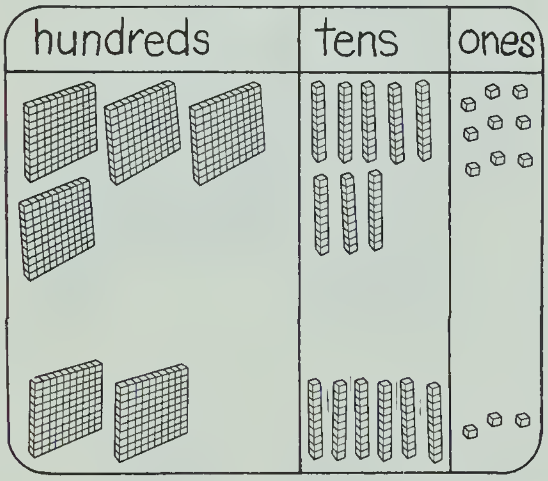
1

Gather the children around the working area and distribute the place-value mats and materials. Write on the easel an addition question that involves making two exchanges; for example

Add.

489
+263

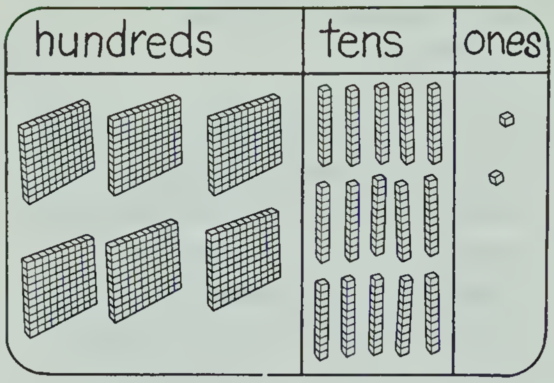
Have the children illustrate each addend with place-value materials on their mats.



Instruct the children to combine the materials, and ask

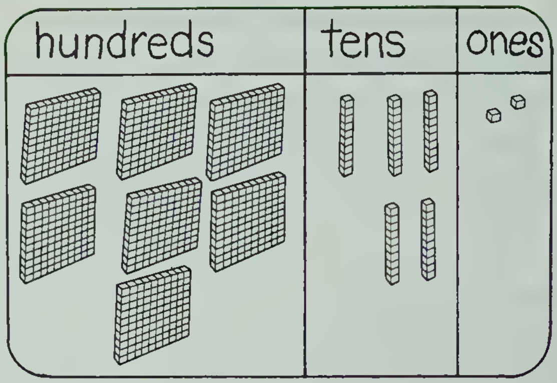
Since there are more than 9 ones, what must be done?

Have the children make the exchange, rearranging materials on their mats accordingly.

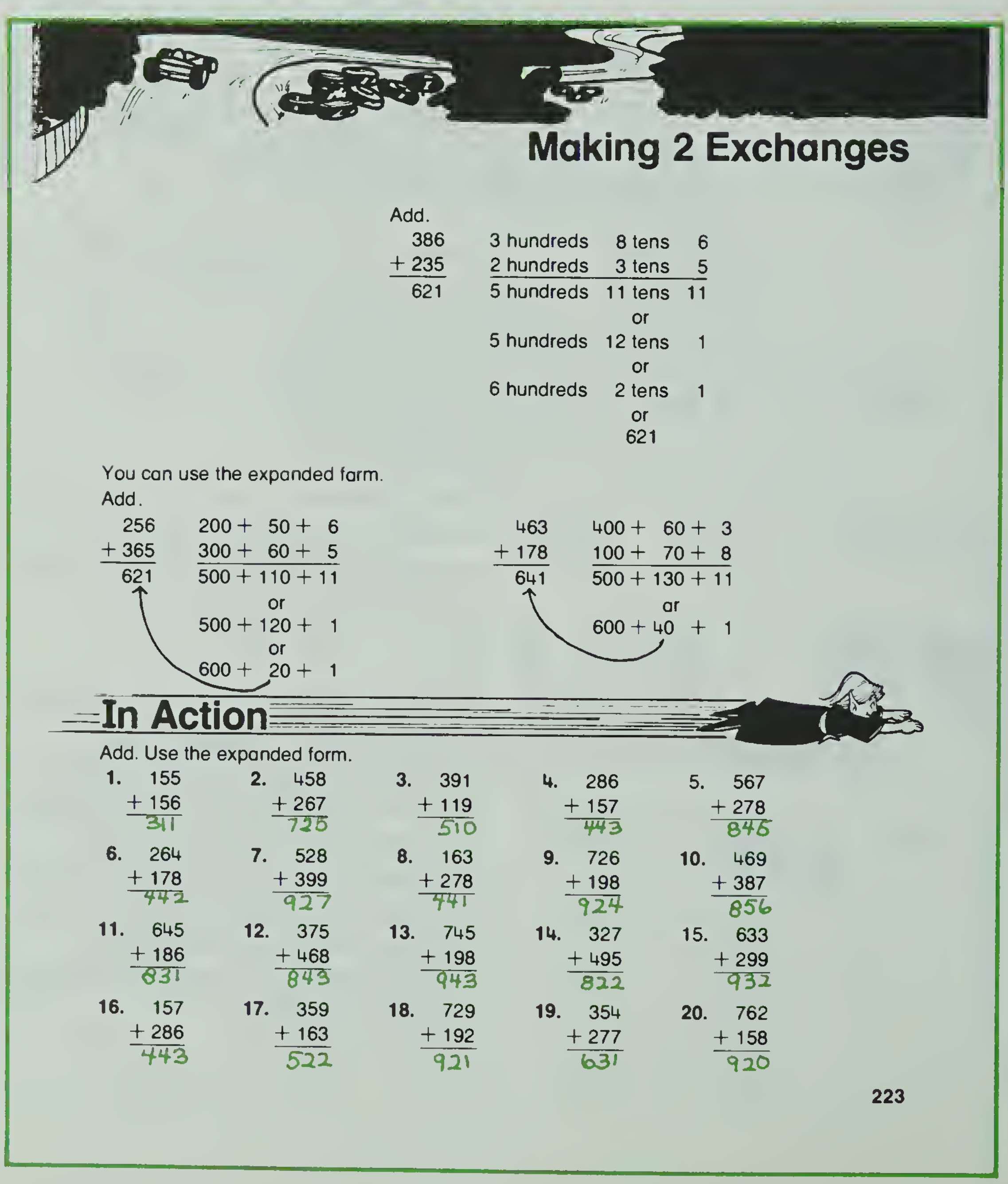


Since there are more than 9 tens, what must be done?

Have the children show the exchange of 10 tens for 1 hundred on their mats.



Ask a child to state the number of ones, tens and hundreds, and record the sum.



Making 2 Exchanges

Add.
386
+ 235
621

3 hundreds 8 tens 6
2 hundreds 3 tens 5
5 hundreds 11 tens 11
or
5 hundreds 12 tens 1
or
6 hundreds 2 tens 1
or
621

You can use the expanded form.
Add.

256
+ 365
621

200 + 50 + 6
300 + 60 + 5
500 + 110 + 11
or
500 + 120 + 1
or
600 + 20 + 1

463
+ 178
641

400 + 60 + 3
100 + 70 + 8
500 + 130 + 11
or
600 + 40 + 1

In Action

Add. Use the expanded form.

1. 155 + 156 311	**2.** 458 + 267 725	**3.** 391 + 119 510	**4.** 286 + 157 443	**5.** 567 + 278 845
6. 264 + 178 442	**7.** 528 + 399 927	**8.** 163 + 278 441	**9.** 726 + 198 924	**10.** 469 + 387 856
11. 645 + 186 831	**12.** 375 + 468 843	**13.** 745 + 198 943	**14.** 327 + 495 822	**15.** 633 + 299 932
16. 157 + 286 443	**17.** 359 + 163 522	**18.** 729 + 192 921	**19.** 354 + 277 631	**20.** 762 + 158 920

223

Add.
489
+263
752

Using several other addition questions that require two exchanges, repeat the procedure.

2

Write an addition question on the easel and have a child rewrite the addends in expanded form.

Add.
364   300 + 60 + 4
+157   100 + 50 + 7

Ask for assistance from the children as you add each column of the expanded numerals and make the exchanges.

Add.
364
+157
521

300 + 60 + 4
100 + 50 + 7
400 + 110 + 11
or
400 + 120 + 1
or
500 + 20 + 1

Emphasize that 400 + 110 + 11, 400 + 120 + 1, 500 + 20 + 1 and 521 are four names for the same number, or four ways of writing the same numeral.

Have the children use place-value materials and mats to illustrate each of the three ways of representing 521.

Remind the children that the exchanges are necessary because only 9 ones are allowed in the ones column, and only 9 tens are allowed in the tens column.

Repeat the procedure several times.

3

Write the following expanded numerals on the easel and have the children copy them.

1. 100 + 140 + 13
2. 500 + 100 + 12
3. 200 + 150 + 17
4. 400 + 130 + 18
5. 100 + 100 + 10
6. 700 + 180 + 14
7. 500 + 170 + 10
8. 600 + 110 + 15
9. 300 + 160 + 11
10. 800 + 120 + 16

For each expanded numeral the children regroup in the following manner:

1. 100 + 140 + 13
   100 + 150 + 3
   200 + 50 + 3
   253

Written and Other Activities

☐

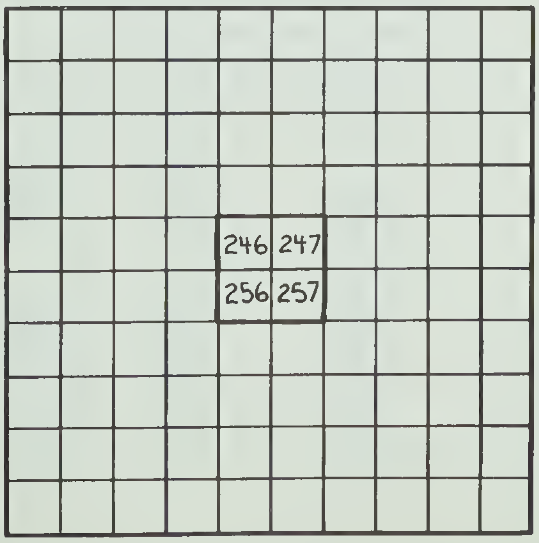
mathways 3, page 223

Have the children show the addends in each example, using place-value materials on place-value mats, and combine and regroup the materials to illustrate each step. Discuss each example. Then have one or two children explain in their own words what they will do to answer the first In Action question. If there appears to be any confusion, have the children assist you in doing the question on the blackboard or easel.

Assign the In Action questions.

☐ ☐

Distribute 100-charts and have the children write in the numbers from 201 to 299. Instruct the children to draw a square box around any four numbers, then add the numbers along the diagonal. The resulting addition questions will have the same sum.



For this square box, these sums result:
246   247
+257   +256
503   503

Have the children complete additions for 10 squares.

☐ ☐ ☐

To review the commutative property of addition, have the children reverse the order of the addends in each of five questions on *mathways 3* page 223, and add to check their work.

Unit 3 Section 6 Lesson 5

Adding Three-Digit Numbers: Thinking the Exchange

Materials

- for each child
  - copy of stencil, *see* ☐ ☐
- for each group of three or four
  - set of coloured dice:
    yellow, marked 1, 1, 2, 3, 4, 4
    blue, marked 0, 1, 6, 7, 8, 9
    red, marked 2, 3, 4, 5, 8, 9

Lesson

1

Gather the children around the easel. Write an addition question involving two exchanges. Then write each addend in expanded form.

Add.

$$\begin{array}{rl} 486 & 400 + 80 + 6 \\ \underline{+275} & \underline{200 + 70 + 5} \end{array}$$

With the assistance of the children, complete the addition for the expanded form.

Add.

$$\begin{array}{rl} 486 & 400 + \ 80 + \ 6 \\ \underline{+275} & \underline{200 + \ 70 + \ 5} \\ & 600 + 150 + 11 \end{array}$$

Ask

Can we allow more than 9 ones in the ones column? What must we do? Can we allow more than 9 tens in the tens column? What must we do?

After allowing time for the children to respond, make the exchanges and write the standard numeral under the question.

Add.

$$\begin{array}{rl} 486 & 400 + \ 80 + \ 6 \\ \underline{+275} & \underline{200 + \ 70 + \ 5} \\ 761 & 600 + 150 + 11 \\ & \text{or} \\ & 600 + 150 + 1 \\ & \text{or} \\ & 700 + 60 + 1 \end{array}$$

Have a child point out the four ways of writing the same numeral: 600 + 150 + 11, 600 + 160 + 1, 700 + 60 + 1 and 761. Discuss the equivalence in value among them.

2

Write the same addition exercise on the easel and tell the children that they can add and make exchanges with less writing.

Add.

$$\begin{array}{r} 456 \\ \underline{+278} \end{array}$$

Point to the 8 and then the 6, and say *14*.

We write the 4 in the ones column.

Point to the 7 in the tens column, explain that the 1 ten from the 14 is added to the 7, and say *eight*. Point to the 5 in the tens column and say *13*.

We write the 3 in the tens column.

Point to the 2 in the hundreds column, explain that the 1 hundred from the 13 tens is added to the 2, and say *three*.

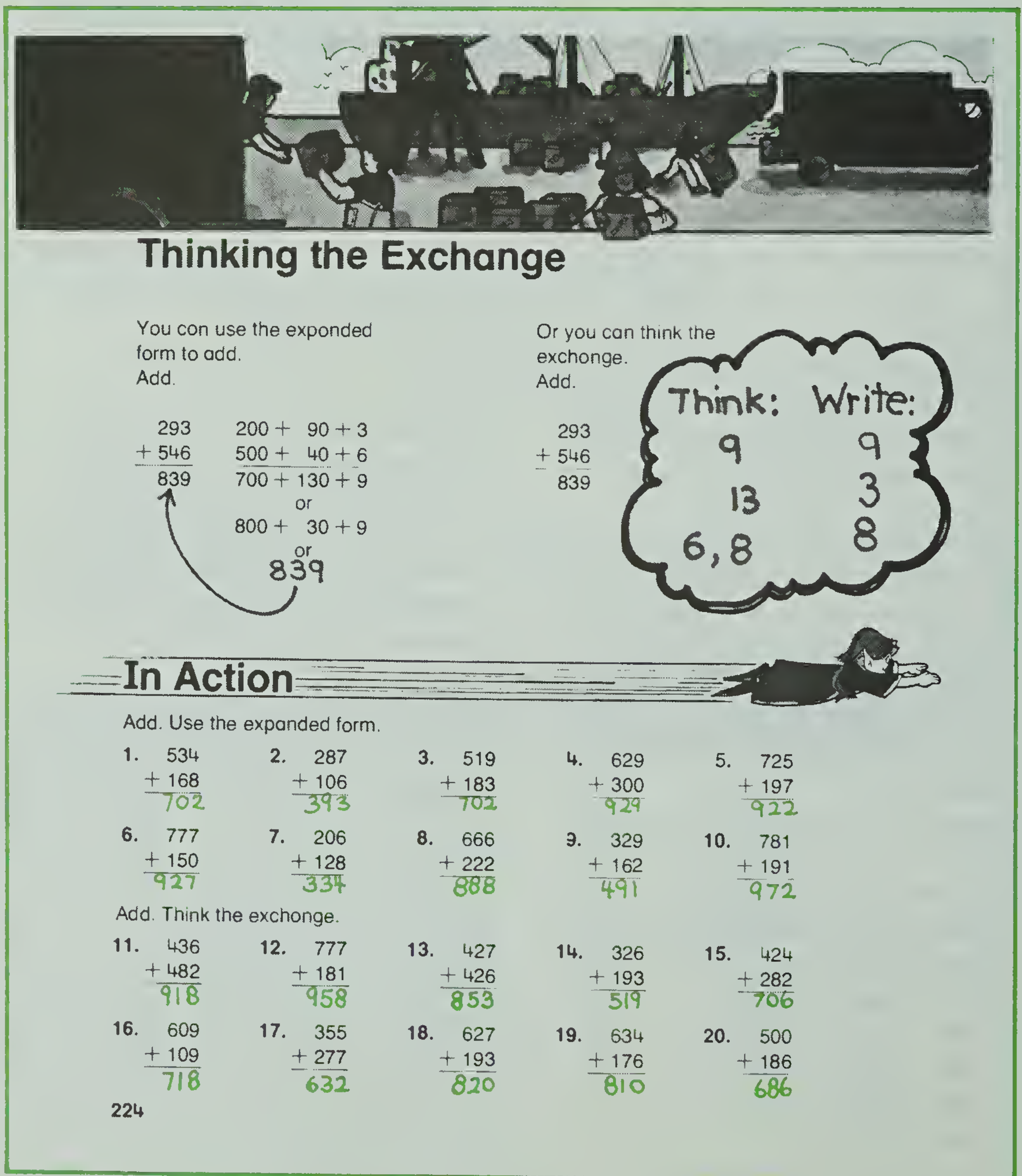
Point to the 4 in the hundreds column and say *seven*.

We write the 7 in the hundreds column.

Repeat this for a few other questions.

3

Invite small groups of children to play a game. Give each group a set of coloured dice, a yellow die marked 1, 1, 2, 3, 4, 4 for hundreds, a blue die marked 0, 1, 6, 7, 8, 9 for tens, and a red die marked 2, 3, 4, 5, 8, 9 for ones. A player tosses the dice and all the children record the number as the first addend. A second player tosses the dice and the children record the number as the second addend. Each



Thinking the Exchange

You con use the exponded form to add.
Add.

$$\begin{array}{rl} 293 & 200 + \ 90 + 3 \\ \underline{+\ 546} & \underline{500 + \ 40 + 6} \\ 839 & 700 + 130 + 9 \\ & \text{or} \\ & 800 + \ 30 + 9 \\ & \text{or} \\ & 839 \end{array}$$

Or you can think the exchonge.
Add.

$$\begin{array}{r} 293 \\ \underline{+\ 546} \\ 839 \end{array}$$

Think:	Write:
9	9
13	3
6, 8	8

In Action

Add. Use the expanded form.

1. $\begin{array}{r} 534 \\ \underline{+\ 168} \\ 702 \end{array}$ 2. $\begin{array}{r} 287 \\ \underline{+\ 106} \\ 393 \end{array}$ 3. $\begin{array}{r} 519 \\ \underline{+\ 183} \\ 702 \end{array}$ 4. $\begin{array}{r} 629 \\ \underline{+\ 300} \\ 929 \end{array}$ 5. $\begin{array}{r} 725 \\ \underline{+\ 197} \\ 922 \end{array}$

6. $\begin{array}{r} 777 \\ \underline{+\ 150} \\ 927 \end{array}$ 7. $\begin{array}{r} 206 \\ \underline{+\ 128} \\ 334 \end{array}$ 8. $\begin{array}{r} 666 \\ \underline{+\ 222} \\ 888 \end{array}$ 9. $\begin{array}{r} 329 \\ \underline{+\ 162} \\ 491 \end{array}$ 10. $\begin{array}{r} 781 \\ \underline{+\ 191} \\ 972 \end{array}$

Add. Think the exchonge.

11. $\begin{array}{r} 436 \\ \underline{+\ 482} \\ 918 \end{array}$ 12. $\begin{array}{r} 777 \\ \underline{+\ 181} \\ 958 \end{array}$ 13. $\begin{array}{r} 427 \\ \underline{+\ 426} \\ 853 \end{array}$ 14. $\begin{array}{r} 326 \\ \underline{+\ 193} \\ 519 \end{array}$ 15. $\begin{array}{r} 424 \\ \underline{+\ 282} \\ 706 \end{array}$

16. $\begin{array}{r} 609 \\ \underline{+\ 109} \\ 718 \end{array}$ 17. $\begin{array}{r} 355 \\ \underline{+\ 277} \\ 632 \end{array}$ 18. $\begin{array}{r} 627 \\ \underline{+\ 193} \\ 820 \end{array}$ 19. $\begin{array}{r} 634 \\ \underline{+\ 176} \\ 810 \end{array}$ 20. $\begin{array}{r} 500 \\ \underline{+\ 186} \\ 686 \end{array}$

224

child in the group writes both addends in expanded form, adds, makes the necessary exchanges, then writes the sum. The children then compare sums and correct any mistakes. The next two players take their turns tossing the dice and the game continues.

Written and Other Activities

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mathways 3, page 224

Discuss the example with the children, inviting individuals to explain the steps in their own words for both the expanded numeral and "Think the exchange" forms.

☐ ☐

Challenge the children with a practice sheet on which addition questions have been completed incorrectly. The mistakes include wrong addition facts, incorrect regrouping, unnecessary regrouping, and failing to regroup when necessary. Some additions have more than one mistake. The children's task is to use expanded numerals to find and correct the errors. Prepare and distribute copies of a stencil with the following additions:

Add.

$$\begin{array}{rrrrrr} 1. & 105 & 2. & 192 & 3. & 365 \\ & \underline{+204} & & \underline{+714} & & \underline{+168} \\ & 319 & & 806 & & 532 \\ \\ 4. & 678 & 5. & 315 & 6. & 349 \\ & \underline{+298} & & \underline{+407} & & \underline{+648} \\ & 876 & & 723 & & 887 \\ \\ 7. & 179 & 8. & 260 & 9. & 367 \\ & \underline{+175} & & \underline{+248} & & \underline{+268} \\ & 344 & & 578 & & 434 \\ \\ 10. & 102 & 11. & 458 & 12. & 356 \\ & \underline{+478} & & \underline{+337} & & \underline{+359} \\ & 680 & & 884 & & 806 \end{array}$$

☐ ☐ ☐

mathways 3 Practice Masters page 50

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 78

For Your Notes

For Your Notes

Unit 3 Section 7 Lesson 1

Subtracting Three-Digit Numbers: Exchanging 1 Ten for 10 Ones

Materials

- for each child
  - – place-value mat
  - – nine 100-flats, nine 10-strips, 18 unit strips
  - – copy of stencil, *see* ☐ ☐
  - – abacus

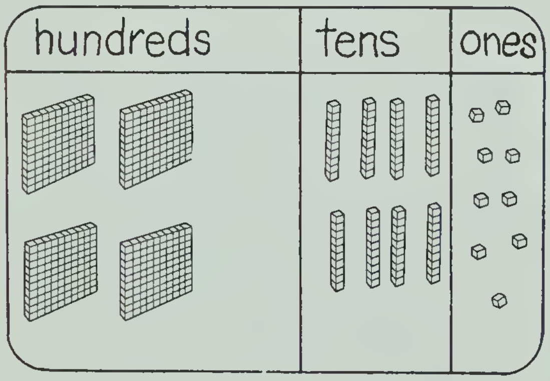
Lesson

1

Seat the children around the working area and distribute the place-value materials and mats. Write on the easel a subtraction question that does not require regrouping.

Subtract.
489
−124

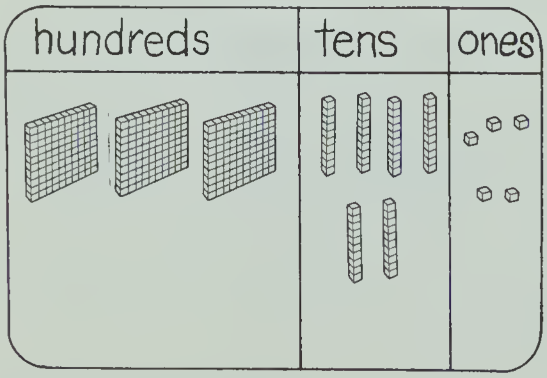
Have the children show the minuend with place-value material on their mats.



Then have the children remove materials from their mats to show subtraction of the subtrahend. Remind them to begin with the ones column and work from right to left. Ask

How many ones are left?
How many tens?
How many hundreds?

As the children respond, record the difference.



Subtract.
489
−124
365

2

Write another subtraction question that does not require regrouping. Have a child write the numbers in expanded form and write the difference in expanded and standard form.

Subtract.
765   700 + 60 + 5
−631   600 + 30 + 1
134   100 + 30 + 4

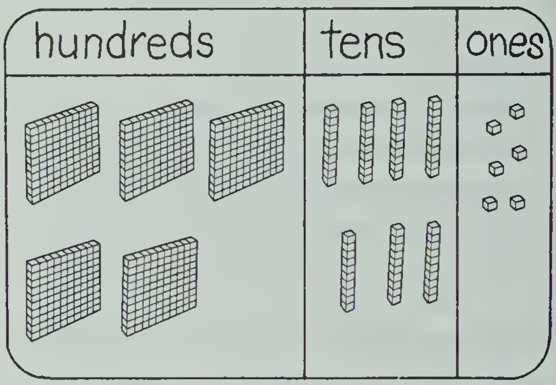
Repeat until each child has had an opportunity to participate. It may be useful to have all the children in the group record each step as the subtraction question is being dealt with on the easel.

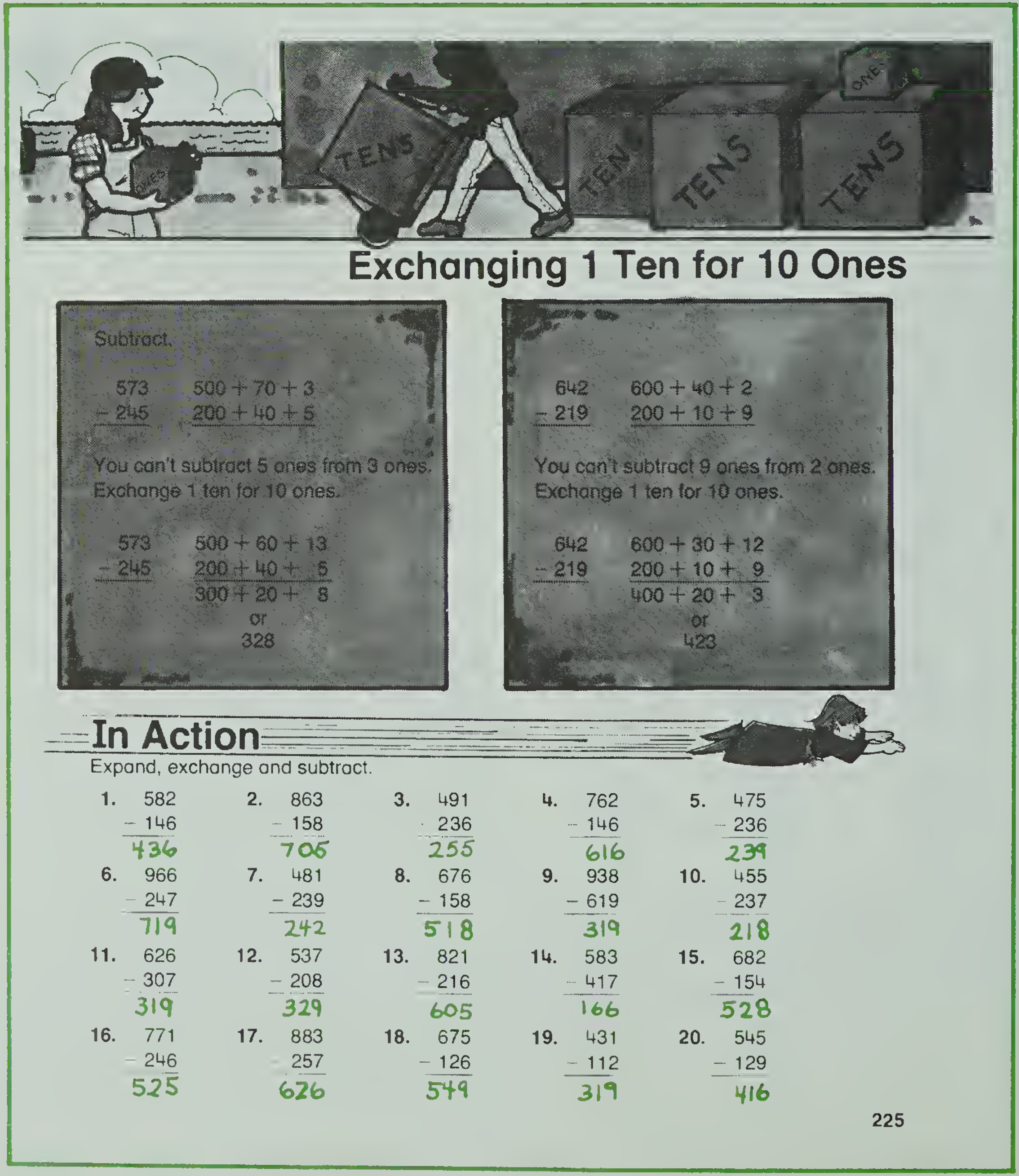
3

Write a subtraction question that requires exchanging a ten for 10 ones.

Subtract.
576
−248

Have the children show the minuend with place-value materials on their mats.





Exchanging 1 Ten for 10 Ones

Subtract.

573   500 + 70 + 3
− 245   200 + 40 + 5

You can't subtract 5 ones from 3 ones.
Exchange 1 ten for 10 ones.

573   500 + 60 + 13
− 245   200 + 40 + 5
    300 + 20 + 8
    or
    328

642   600 + 40 + 2
− 219   200 + 10 + 9

You can't subtract 9 ones from 2 ones.
Exchange 1 ten for 10 ones.

642   600 + 30 + 12
− 219   200 + 10 + 9
    400 + 20 + 3
    or
    423

In Action

Expand, exchange and subtract.

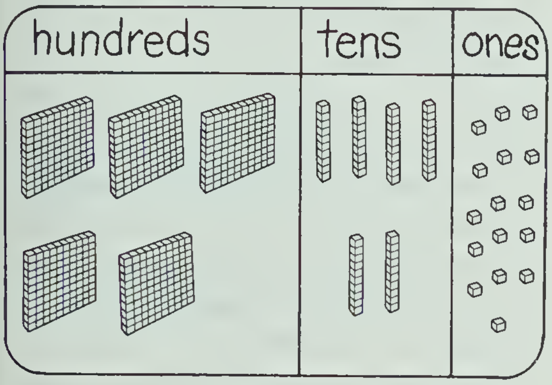
1. 582 − 146 436	2. 863 − 158 706	3. 491 236 255	4. 762 − 146 616	5. 475 − 236 239
6. 966 − 247 719	7. 481 − 239 242	8. 676 − 158 518	9. 938 − 619 319	10. 455 − 237 218
11. 626 − 307 319	12. 537 − 208 329	13. 821 − 216 605	14. 583 − 417 166	15. 682 − 154 528
16. 771 − 246 525	17. 883 257 626	18. 675 − 126 549	19. 431 − 112 319	20. 545 − 129 416

225

Ask

Can we take 8 ones away from 6 ones?
What must we do?

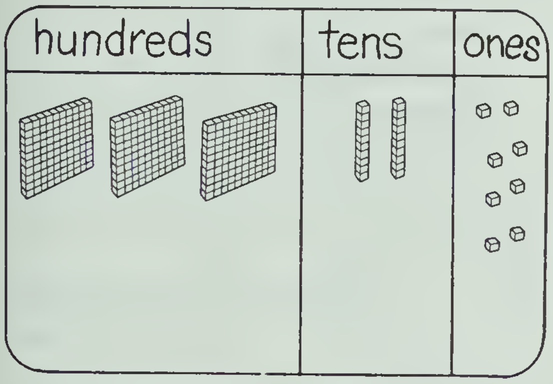
Have the children rearrange materials on their mats to show an exchange of 1 ten for 10 ones.



Have the children remove materials to show subtraction of the subtrahend.

Ask these questions, and as the children respond, record the difference:

How many ones are left on the place-value mat?
How many tens are left?
How many hundreds?



Subtract.

576
−248
328

Repeat, using several other subtraction questions that require an exchange of 1 ten for 10 ones.

4

Write a subtraction question on the easel and have a volunteer write the expanded form of the minuend and subtrahend.

Subtract.

981 900 + 80 + 1
−425 400 + 20 + 5

Can 5 ones be taken away from one?
What must be done?

With the participation of the children, make the exchange.

Have a child subtract and record the difference in expanded and standard forms.

Subtract.

981 900 + 80 + 1
−425 400 + 20 + 5
556 or
900 + 70 + 11
400 + 20 + 5
500 + 50 + 6

Repeat several times, giving each child an opportunity to show the steps.

5

Write three subtraction questions on the easel.

422 341 688
−216 −210 −509

Ask children to identify the question that does not require making an exchange and explain why. Have other children explain why the remaining questions require an exchange. Then appoint a child to do each question, one at a time, while the other children record each step on paper.

Written and Other Activities

☐

mathways 3, page 225

Have children read each example shown aloud. Have all the children use place-value materials to illustrate the exchange in both examples.

☐ ☐

Prepare and distribute copies of a stencil such as the following.

Subtract.

1. 298 −179
2. 865 −213
3. 675 −268
4. 986 −947
5. 721 −304
6. 193 −137
7. 975 −222
8. 485 −201
9. 566 −248
10. 462 −305
11. 485 −366
12. 789 −314

When preparing the stencil, leave enough space for the children to write the expanded form twice for those questions that require regrouping, and once for questions that do not.

☐ ☐ ☐

Have each child write 10 three-digit numbers and, beside each, the expanded form before and after exchanging 1 ten for ten ones.

For example

327 300 + 20 + 7
300 + 10 + 17

When the exercise has been completed, have several children write one of the numerals in standard and expanded forms on the easel and demonstrate the exchange for the group, using place-value materials on a mat. Have other children write one of their numerals and expanded numerals on the easel, and illustrate each step on an abacus, as the other children follow along on the abacus, given to each in advance.

Unit 3 Section 7 Lesson 2

Subtracting Three-Digit Numbers: Exchanging 1 Hundred for 10 Tens

Materials

- for each child
  - – place-value mat
  - – nine 100-flats, eighteen 10-strips, nine unit strips
  - – abacus

Lesson

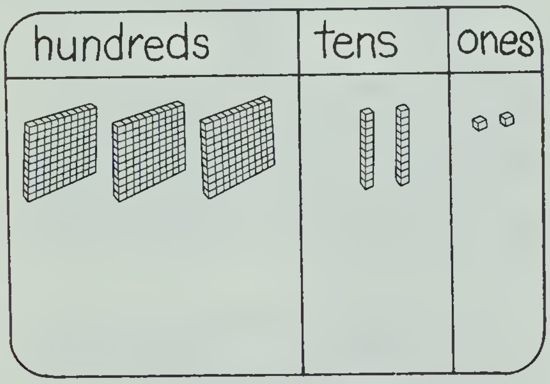
1

Gather the children around the working area and distribute the place-value mats and materials. Write on the easel

Subtract.

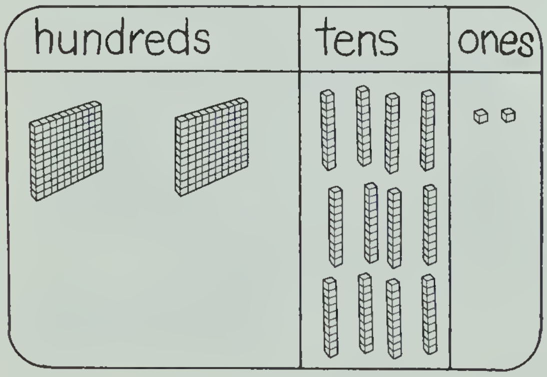
$$\begin{array}{r} 322 \\ \underline{-172} \end{array}$$

Have the children show the minuend with place-value materials on their mats.

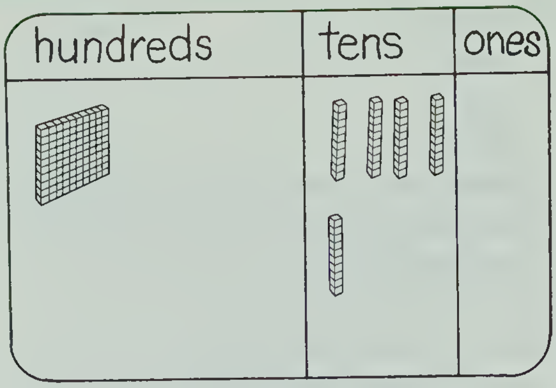


Have the children remove unit strips to show subtracting two ones. Then ask *Can we subtract 7 tens from 2 tens? What must we do?*

On a mat, demonstrate the exchange and have the children follow suit, rearranging materials on their mats.



Have the children remove materials to complete the subtraction in the tens and hundreds columns.



How many ones are left on your mats?
How many tens are left?
How many hundreds?

As the children respond, record the difference.

Subtract.

$$\begin{array}{r} 322 \\ \underline{-172} \\ 150 \end{array}$$

Repeat, using other examples.

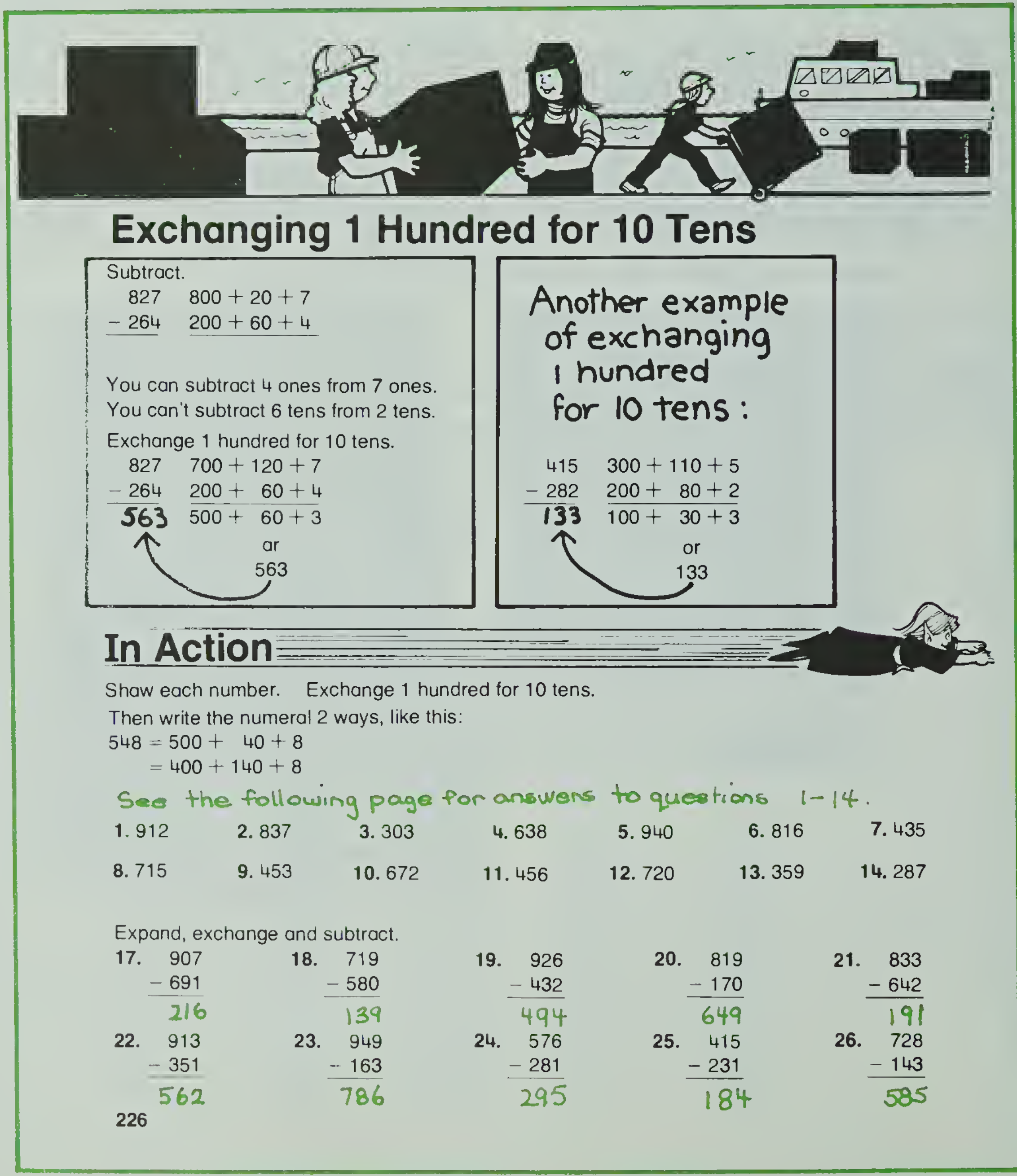
2

Write on the easel

Subtract.

$$\begin{array}{rl} 426 & 400 + 20 + 6 \\ \underline{-152} & \underline{100 + 50 + 2} \end{array}$$

Question the children to establish that no exchange is necessary to subtract the ones column in the expanded form, but that an exchange is necessary to subtract the tens column. With the assistance of the children, exchange 10 tens for 1 hundred, rewriting the expanded form accordingly.



Exchanging 1 Hundred for 10 Tens

Subtract.

$$\begin{array}{rl} 827 & 800 + 20 + 7 \\ \underline{-\ 264} & \underline{200 + 60 + 4} \end{array}$$

You can subtract 4 ones from 7 ones.
You can't subtract 6 tens from 2 tens.
Exchange 1 hundred for 10 tens.

$$\begin{array}{rl} 827 & 700 + 120 + 7 \\ \underline{-\ 264} & \underline{200 + \ \ 60 + 4} \\ 563 & 500 + \ \ 60 + 3 \end{array}$$

or
563

Another example of exchanging 1 hundred for 10 tens:

$$\begin{array}{rl} 415 & 300 + 110 + 5 \\ \underline{-\ 282} & \underline{200 + \ \ 80 + 2} \\ 133 & 100 + \ \ 30 + 3 \end{array}$$

or
133

In Action

Show each number. Exchange 1 hundred for 10 tens.
Then write the numeral 2 ways, like this:
548 = 500 + 40 + 8
= 400 + 140 + 8

See the following page for answers to questions 1–14.

1. 912 2. 837 3. 303 4. 638 5. 940 6. 816 7. 435
8. 715 9. 453 10. 672 11. 456 12. 720 13. 359 14. 287

Expand, exchange and subtract.

17.	18.	19.	20.	21.
907 − 691 216	719 − 580 139	926 − 432 494	819 − 170 649	833 − 642 191

22.	23.	24.	25.	26.
913 − 351 562	949 − 163 786	576 − 281 295	415 − 231 184	728 − 143 585

Subtract.

$$\begin{array}{rl} 426 & 400 + 20 + 6 \\ \underline{-152} & \underline{100 + 50 + 2} \\ & \text{or} \\ & 300 + 120 + 6 \\ & \underline{100 + \ \ 50 + 2} \end{array}$$

Have a volunteer complete the subtraction, writing the sum for the expanded form and the standard form.

Subtract.

$$\begin{array}{rl} 426 & 400 + 20 + 6 \\ \underline{-152} & \underline{100 + 50 + 2} \\ 274 & \text{or} \\ & 300 + 120 + 6 \\ & \underline{100 + \ \ 50 + 2} \\ & 200 + \ \ 70 + 4 \end{array}$$

Repeat several times. Include examples that have zero in the minuend or subtrahend. It may be useful to have all the children record each step as the questions are being dealt with on the easel. For variety, give each child an abacus with which to show the steps in each of several questions.

3

To review the relation between addition and subtraction, have a child do a question on the easel, then check it by adding the difference and the subtrahend. If it seems desirable, have the children show the addition on the abacus or with place-value materials.

Written and Other Activities

☐

mathways 3, page 226

Discuss both examples. Point out that by thinking about it, one step – that of writing the first expanded numeral – can be omitted and the exchange of 10 tens for 1 hundred can be done directly. If it seems advisable, write several standard numerals on the easel and have volunteers write the expanded form to show that an exchange has already occurred. When the children seem fairly comfortable with the idea, assign the In Action questions, encouraging them to apply the principle to questions 17 to 22 whenever possible.

☐ ☐

Have a few children use place-value materials to demonstrate the steps for completing two or three subtraction questions on page 226. Have a few other children use an abacus to demonstrate each step in completing the same questions, so that the children can compare the two modes.

☐ ☐ ☐

Have the children check several of the questions on page 226 by adding the subtrahend and the difference.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 51

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 79

Additional Answers

1. 912 = 900 + 10 + 2
 = 800 + 110 + 2
2. 837 = 800 + 30 + 7
 = 700 + 130 + 7
3. 303 = 300 + 3
 = 200 + 100 + 3
4. 638 = 600 + 30 + 8
 = 500 + 130 + 8
5. 940 = 900 + 40
 = 800 + 140
6. 816 = 800 + 10 + 6
 = 700 + 110 + 6
7. 435 = 400 + 30 + 5
 = 300 + 130 + 5
8. 715 = 700 + 10 + 5
 = 600 + 110 + 5
9. 453 = 400 + 50 + 3
 = 300 + 150 + 3
10. 672 = 600 + 70 + 2
 = 500 + 170 + 2
11. 456 = 400 + 50 + 6
 = 300 + 150 + 6
12. 720 = 700 + 20
 = 600 + 120
13. 359 = 300 + 50 + 9
 200 + 150 + 9
14. 287 = 200 + 80 + 7
 100 + 180 + 7

For Your Notes

Unit 3 Section 7 Lesson 3

Subtracting Three-Digit Numbers: Two Exchanges

Materials

- for each child
  - place-value mat
  - nine 100-flats, eighteen 10-strips, 18 unit strips

Lesson

1

Gather the children around the working area and distribute place-value material and mats.

Write on the easel

Subtract.

$$\begin{array}{r} 451 \\ -259 \\ \hline \end{array}$$

Have the children show the minuend on their place-value mats.

Can we take 9 ones away from one?
What must be done?
Can you show us on your mat, please, Carrie?

Have all the children make the exchange on their mats.

What must be done before we can subtract 5 tens in the tens column?
Can you show us on your mat, please, Darrel?

Have all the children show the exchange of 10 tens for 1 hundred. Then have them remove materials from their mats to show subtraction of the subtrahend. Have a child record the difference.

Subtract.

$$\begin{array}{r} 451 \\ -259 \\ \hline 192 \end{array}$$

Repeat the procedure, using several examples requiring two exchanges.

2

Write several subtraction questions such as the following on the easel, and have volunteers complete them on the easel as the other children show each step on paper.

Subtract.

$$\begin{array}{r} 529 \\ -156 \\ \hline 373 \end{array} \qquad \begin{array}{rrr} 500 & +\ 20 & +\ 9 \\ \underline{100} & \underline{+\ 50} & \underline{+\ 6} \\ & \text{or} & \\ 400 & +\ 120 & +\ 9 \\ \underline{100} & \underline{+\ \ 50} & \underline{+\ 6} \\ 300 & +\ \ 70 & +\ 3 \end{array}$$

3

Have each child write 10 three-digit numbers on a sheet of paper or in a notebook and write the expanded form three times to show the number before and after two exchanges have been made. For example

253
200 + 50 + 3
200 + 40 + 13
100 + 140 + 13

Select children to write examples of their work on the easel and have them demonstrate the steps with place-value material. Discuss the equivalence in value among all four forms of each numeral.

Written and Other Activities

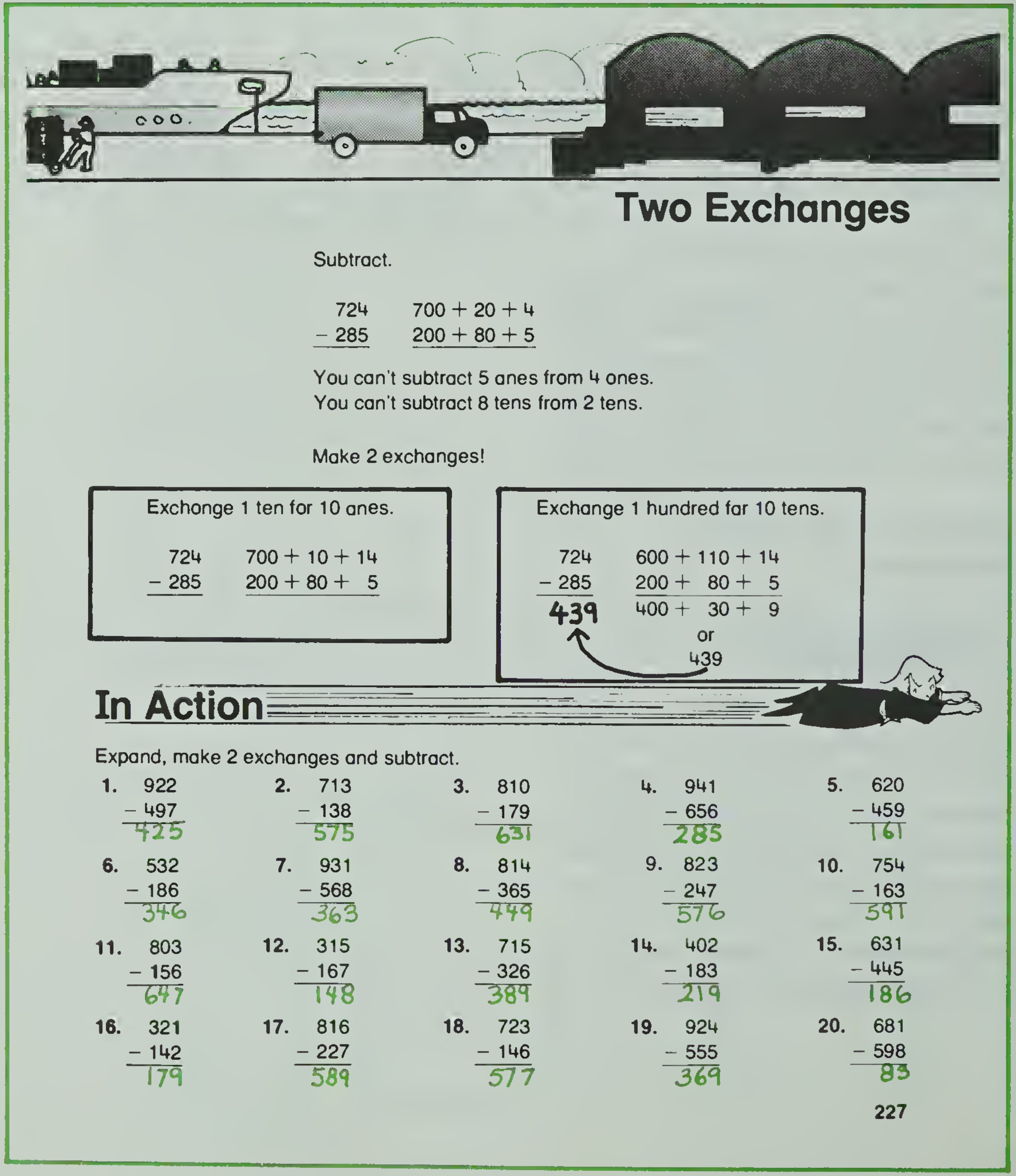
☐

mathways 3, page 227

Discuss the example, comparing the expanded form for each step and emphasizing the reason for each exchange. Have one or two children explain how they will do the In Action questions.

☐ ☐

mathways 3 Practice Masters page 52



Two Exchanges

Subtract.

$$\begin{array}{r} 724 \\ -\ 285 \\ \hline \end{array} \qquad \begin{array}{l} 700 + 20 + 4 \\ \underline{200 + 80 + 5} \end{array}$$

You can't subtract 5 ones from 4 ones.
You can't subtract 8 tens from 2 tens.

Make 2 exchanges!

Exchange 1 ten for 10 ones.

$$\begin{array}{r} 724 \\ -\ 285 \\ \hline \end{array} \qquad \begin{array}{l} 700 + 10 + 14 \\ \underline{200 + 80 +\ \ 5} \end{array}$$

Exchange 1 hundred for 10 tens.

$$\begin{array}{r} 724 \\ -\ 285 \\ \hline 439 \end{array} \qquad \begin{array}{l} 600 + 110 + 14 \\ \underline{200 +\ \ 80 +\ \ 5} \\ 400 +\ \ 30 +\ \ 9 \\ \qquad \text{or} \\ \qquad 439 \end{array}$$

In Action

Expand, make 2 exchanges and subtract.

1. $\begin{array}{r} 922 \\ -\ 497 \\ \hline 425 \end{array}$ 2. $\begin{array}{r} 713 \\ -\ 138 \\ \hline 575 \end{array}$ 3. $\begin{array}{r} 810 \\ -\ 179 \\ \hline 631 \end{array}$ 4. $\begin{array}{r} 941 \\ -\ 656 \\ \hline 285 \end{array}$ 5. $\begin{array}{r} 620 \\ -\ 459 \\ \hline 161 \end{array}$

6. $\begin{array}{r} 532 \\ -\ 186 \\ \hline 346 \end{array}$ 7. $\begin{array}{r} 931 \\ -\ 568 \\ \hline 363 \end{array}$ 8. $\begin{array}{r} 814 \\ -\ 365 \\ \hline 449 \end{array}$ 9. $\begin{array}{r} 823 \\ -\ 247 \\ \hline 576 \end{array}$ 10. $\begin{array}{r} 754 \\ -\ 163 \\ \hline 591 \end{array}$

11. $\begin{array}{r} 803 \\ -\ 156 \\ \hline 647 \end{array}$ 12. $\begin{array}{r} 315 \\ -\ 167 \\ \hline 148 \end{array}$ 13. $\begin{array}{r} 715 \\ -\ 326 \\ \hline 389 \end{array}$ 14. $\begin{array}{r} 402 \\ -\ 183 \\ \hline 219 \end{array}$ 15. $\begin{array}{r} 631 \\ -\ 445 \\ \hline 186 \end{array}$

16. $\begin{array}{r} 321 \\ -\ 142 \\ \hline 179 \end{array}$ 17. $\begin{array}{r} 816 \\ -\ 227 \\ \hline 589 \end{array}$ 18. $\begin{array}{r} 723 \\ -\ 146 \\ \hline 577 \end{array}$ 19. $\begin{array}{r} 924 \\ -\ 555 \\ \hline 369 \end{array}$ 20. $\begin{array}{r} 681 \\ -\ 598 \\ \hline 83 \end{array}$

227

Unit 3 Section 7 Lesson 4

Thinking the Exchanges for Adding and Subtracting

Rationale

The lesson on pupil page 228 shows a transition from the expanded form for addition and for subtraction to the algorithm. In the preceding lessons, the expanded form was recorded. In this lesson, the numbers that would be recorded for the expanded form are thought and the sum or difference is written.

Lesson

1

Review the expanded form for addition as outlined in activity **2** on pupil page 224.

2

Recall thinking the exchange in addition as explained in activity **2** for pupil page 224.

3

Review the expanded form for subtraction.

Subtract.

$$\begin{array}{r} 647 \\ \underline{-389} \end{array} \qquad \begin{array}{c} 600 + 40 + 7 \\ \underline{300 + 80 + 9} \\ \text{or} \\ 600 + 30 + 17 \\ \underline{300 + 80 + 9} \\ \text{or} \\ 500 + 130 + 17 \\ \underline{300 + 80 + 9} \\ 200 + 50 + 8 \end{array}$$

4

Write the same subtraction on the easel and tell the children that they can make the exchanges and subtract with less writing.

Subtract.

$$\begin{array}{r} 647 \\ \underline{-389} \end{array}$$

Explain that since 9 ones cannot be subtracted from 7 ones, 1 ten is regrouped as 10 ones resulting in 17 ones. Point to the 7 and say *17.* Point to the 9, say

Eight.

We write the 8 in the ones column.

Explain that when 1 ten is regrouped as 10 ones, 3 tens remain. Discuss that since 8 tens cannot be subtracted from 3 tens, 1 hundred must be regrouped as 10 tens, resulting in 13 tens. Point to the 4 and say *13.* Then point to the 8 and say *Five.*

We record the 5 in the tens column.

Explain that when 1 hundred is regrouped as 10 tens, 5 hundreds remain. Point to the 6 and say 5. Then point to the 3 and say *two*. We record 2 in the hundreds column.

Repeat this for a few other questions.

Written and Other Activities

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mathways 3, page 228

Have the children use subtraction to check three addition exercises and use addition to check three subtraction exercises.

☐ ☐

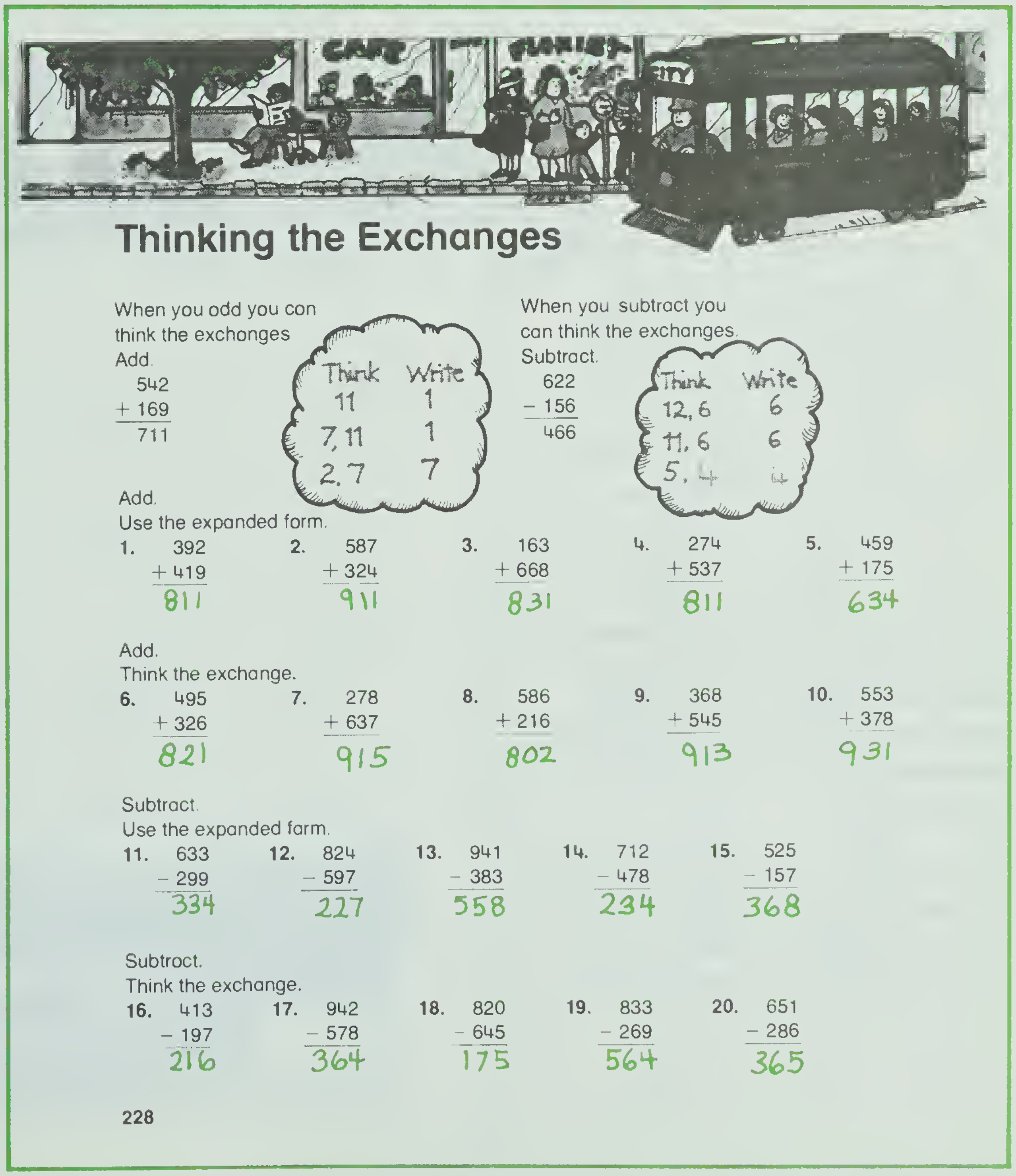
The children may require extra practice to enable them to think the exchanges quickly. Divide the class into small groups. Have the children in each group take turns writing an addition or subtraction exercise on the board, stating the numbers that are thought, and writing the result.

☐ ☐ ☐

For the addition exercise on pupil page 228, explain the reason for each number that is thought and for each number that is written. Then explain the reason for each number that is thought and for each number that is written for the subtraction exercises. Assign the exercises.

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 80



Thinking the Exchanges

When you add you can think the exchanges

Add.

$$\begin{array}{r} 542 \\ \underline{+169} \\ 711 \end{array}$$

Think	Write
11	1
7, 11	1
2, 7	7

When you subtract you can think the exchanges.

Subtract.

$$\begin{array}{r} 622 \\ \underline{-156} \\ 466 \end{array}$$

Think	Write
12, 6	6
11, 6	6
5, 4	4

Add.

Use the expanded form.

1.	2.	3.	4.	5.
392	587	163	274	459
+ 419	+ 324	+ 668	+ 537	+ 175
811	911	831	811	634

Add.

Think the exchange.

6.	7.	8.	9.	10.
495	278	586	368	553
+ 326	+ 637	+ 216	+ 545	+ 378
821	915	802	913	931

Subtract.

Use the expanded form.

11.	12.	13.	14.	15.
633	824	941	712	525
− 299	− 597	− 383	− 478	− 157
334	227	558	234	368

Subtract.

Think the exchange.

16.	17.	18.	19.	20.
413	942	820	833	651
− 197	− 578	− 645	− 269	− 286
216	364	175	564	365

228

Unit 3 Section 7 Lesson 5

Byway: Finding the Missing Numbers

Materials

- stencil, *see* □ □

Rationale

The Byway pages in *mathways 3* are designed to challenge the children in ways that are both interesting and fun. Finding the missing digit in addition and subtraction questions emphasizes the relation between the two algorithms and encourages the children to think about adding and subtracting in another way.

Lesson

1

Gather the children around the working area. Review addition and subtraction facts by writing number sentences such as the following on the easel:

6 + □ = 11
12 − □ = 7
□ + 6 = 8
1□ − 9 = 9

After the children have completed the first few number sentences, invite individuals to write missing-digit sentences on the easel for the other children to complete. Continue the activity while interest remains high.

2

Write on the easel addition questions that do not involve regrouping.

□25	30□	1□7
+3□1	+1□4	+□3□
57□	□68	298

Have the children find the missing digits. Recall the inverse relation between addition and subtraction and invite children to explain how subtracting can help in finding the missing digits.

3

Write addition questions that require regrouping. Demonstrate how the exchanges affect the addends and have the children find the missing digits.

4□4	□8□	680
+□38	+2□2	+17□
91□	740	□□3

4

Write subtraction questions that do not involve exchanges. Recall the inverse relation between addition and subtraction. Ask a child to explain how adding can help in finding the missing digits.

□45	5□9	8□□
−2□5	−□4□	−423
73□	301	□11

5

Write subtraction questions that require exchanges on the easel. Demonstrate how the exchanges affect the minuends. Have volunteers supply the missing digits.

5□8	□9□	6□0
−28□	−1□8	−□35
□73	148	47□

Written and Other Activities

□

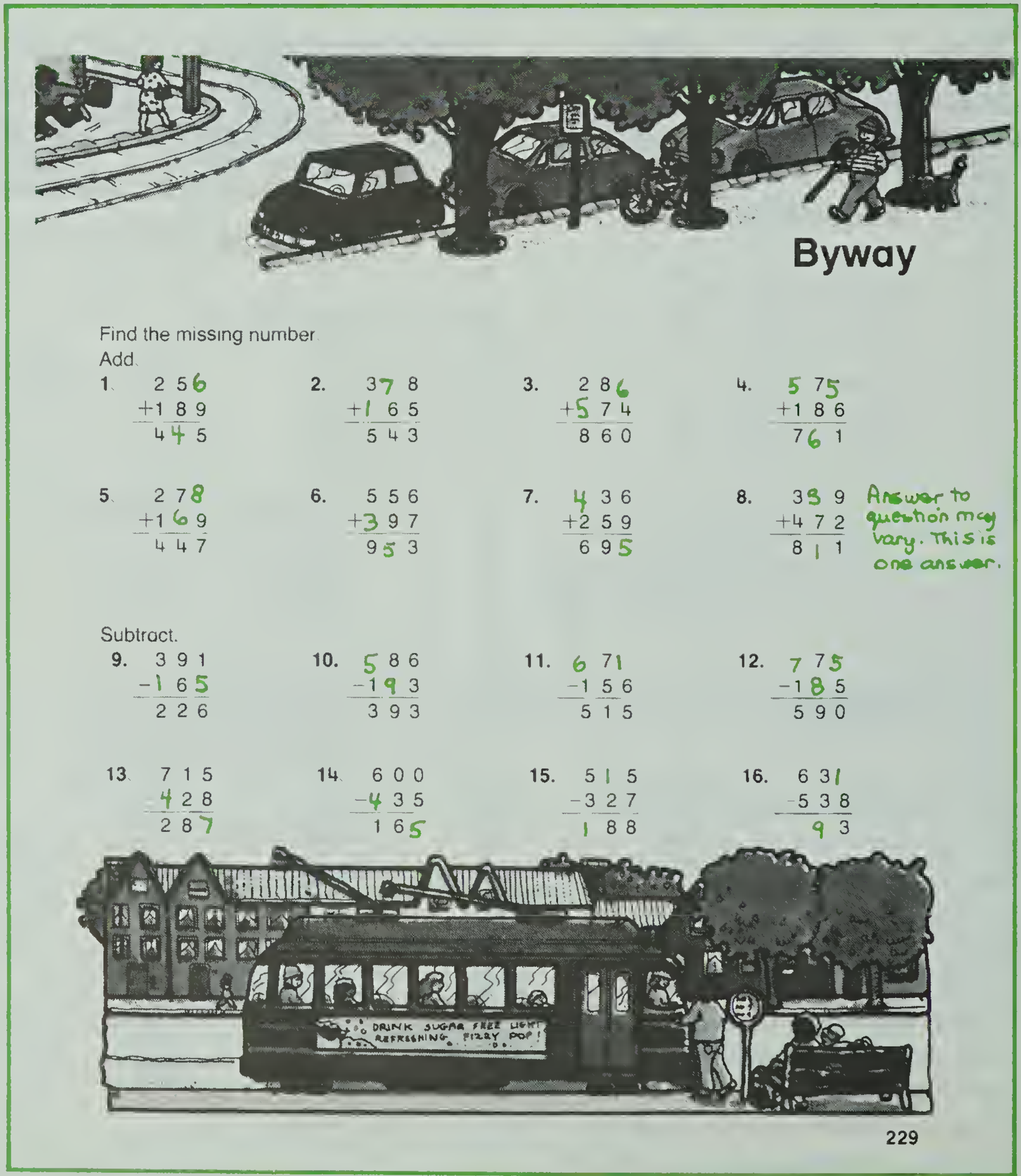
mathways 3, page 229

□ □

To elicit participation from children who find the questions on page 229 too difficult, distribute copies of a stencil such as the following:

Add.

1. 2□5	2. 63□	3. □25
+□22	+1□6	+1□□
64□	□68	358
4. □□3	5. □54	6. □12
+414	+2□0	+41□
98□	39□	5□7



Byway

Find the missing number.

Add.

1. 256	2. 378	3. 286	4. 575
+189	+165	+574	+186
445	543	860	761
5. 278	6. 556	7. 436	8. 339
+169	+397	+259	+472
447	953	695	811

Answer to question may vary. This is one answer.

Subtract.

9. 391	10. 586	11. 671	12. 775
−165	−193	−156	−185
226	393	515	590
13. 715	14. 600	15. 515	16. 631
−428	−435	−327	−538
287	165	188	93

229

Unit 3 Section 7 Lesson 6

Recalling Addition and Subtraction of Two- and Three-Digit Numbers

Lesson

1

Review with the children each type of addition and subtraction question presented. Write examples of each of the following on the easel twice, and have one child use the expanded form to complete a question while another child uses the short form:

- two-digit numbers, no exchange
- two-digit numbers, exchange of a ten for 10 ones
- three-digit numbers, no exchange
- three-digit numbers, an exchange of a ten for 10 ones
- three-digit numbers, an exchange of 10 tens for a hundred
- three-digit numbers, two exchanges

It may be useful to have some children write each step as the questions are being dealt with on the easel.

Written and Other Activities

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mathways 3, page 230

Based on the children's performance in completing this review, determine the cause of errors and provide more practice with concrete materials. Such activities can be done in small groups, so that children can compare their work and share knowledge.

☐ ☐

mathways 3 Practice Masters page 53

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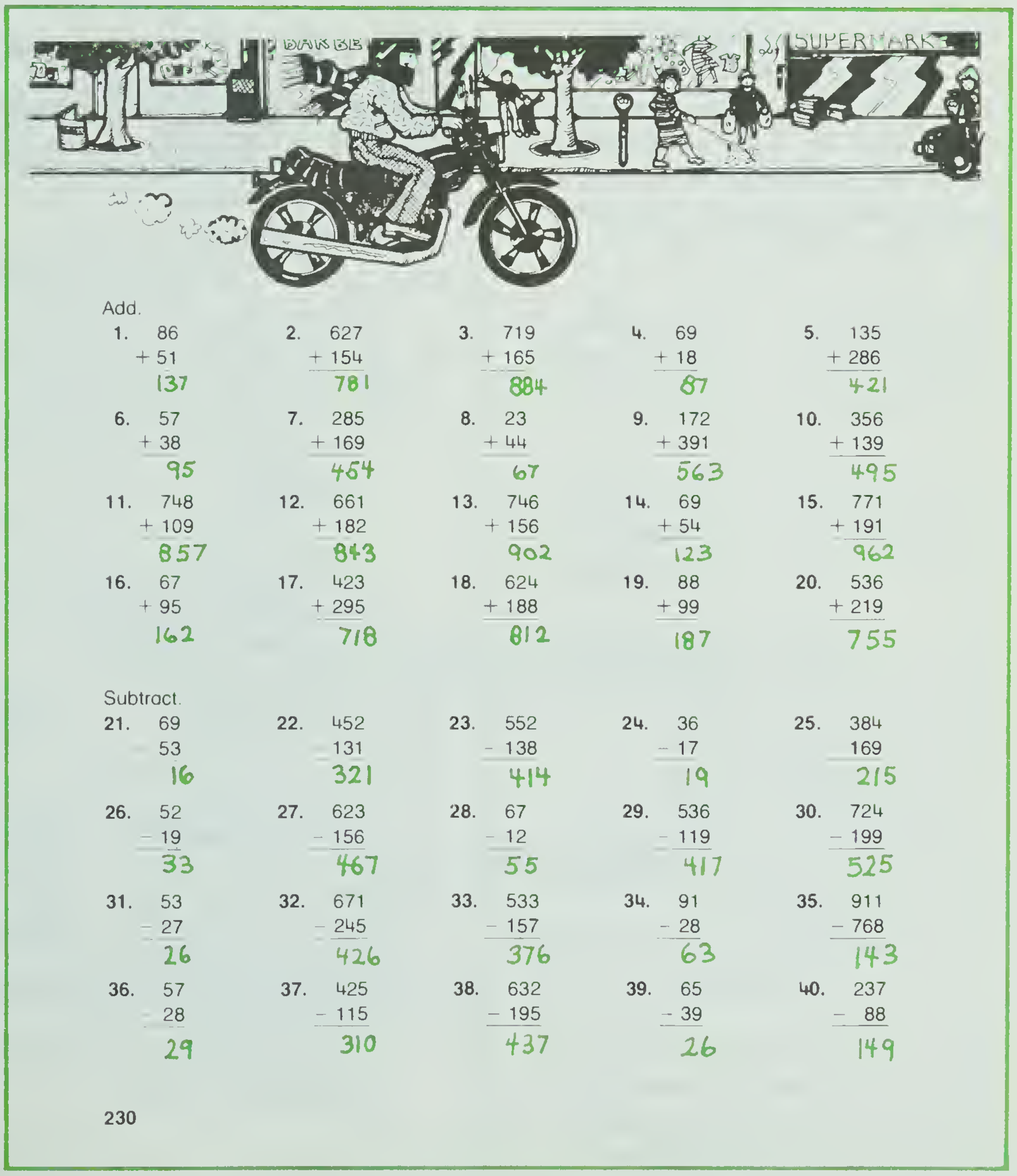
mathways 3 Plus Workbook page 81

For Your Notes



Add.

1. 86 + 51 137	2. 627 + 154 781	3. 719 + 165 884	4. 69 + 18 87	5. 135 + 286 421
6. 57 + 38 95	7. 285 + 169 454	8. 23 + 44 67	9. 172 + 391 563	10. 356 + 139 495
11. 748 + 109 857	12. 661 + 182 843	13. 746 + 156 902	14. 69 + 54 123	15. 771 + 191 962
16. 67 + 95 162	17. 423 + 295 718	18. 624 + 188 812	19. 88 + 99 187	20. 536 + 219 755

Subtract.

21. 69 53 16	22. 452 131 321	23. 552 − 138 414	24. 36 − 17 19	25. 384 169 215
26. 52 − 19 33	27. 623 − 156 467	28. 67 − 12 55	29. 536 − 119 417	30. 724 − 199 525
31. 53 − 27 26	32. 671 − 245 426	33. 533 − 157 376	34. 91 − 28 63	35. 911 − 768 143
36. 57 28 29	37. 425 − 115 310	38. 632 − 195 437	39. 65 − 39 26	40. 237 − 88 149

Unit 3 Section 7 Lesson 7
Making and Using Maps, Making Up and Solving Problems

Materials

- for each child
  - tracing paper
- for each group
  - construction paper and a variety of materials for making a model of a neighbourhood, *see* □ □

Rationale

Making and using maps develops logical thinking and helps clarify concepts of direction, distance and alternate paths to a location, enabling children to deal successfully with word problems based on these concepts as well as with situations that commonly confront them in everyday life.

Lesson

1

Gather the children around the working area. Discuss directions, pointing out north, south, east and west, relative to the location of the classroom. Make signs for each of the four directions and post each on the appropriate classroom wall.

North

South

East

West

Then have different children follow directions such as these:

Walk three steps north.
Walk three steps west.
Walk three steps south and three steps east.
Walk 10 steps east, three steps south and 10 steps west.

Continue the activity, giving each child an opportunity to participate.

2

On the easel sketch the immediate area in which the school is located. With the children's help label the directions, pointing out to the children that traditionally map makers have agreed to put north at the top of the page, east to the right, west to the left and south at the bottom of the page. Mark important and familiar features on the map – street names or highway numbers, an aerial view of the school drawn in the correct location, trees in the schoolyard, other buildings in the immediate vicinity and so on.

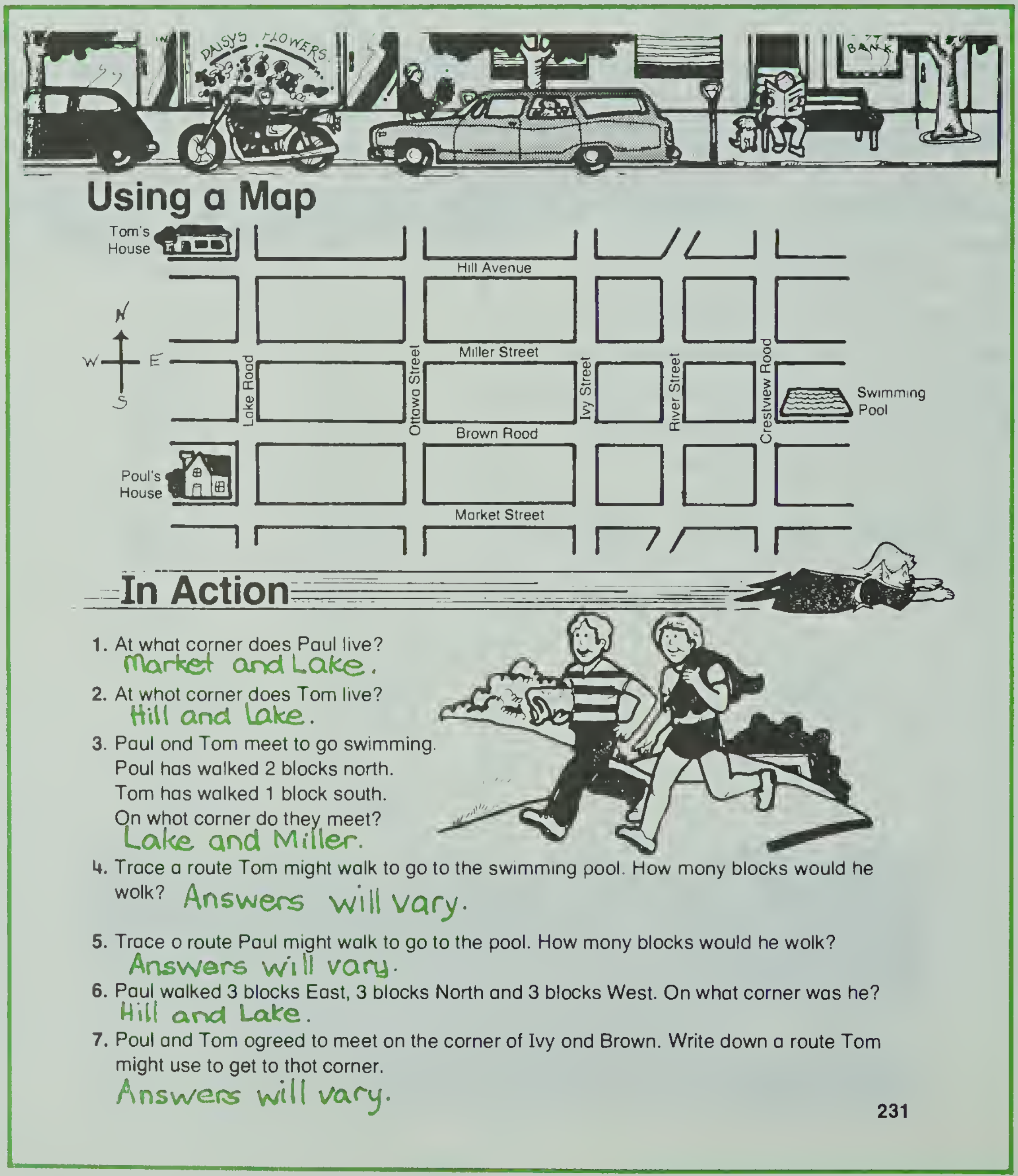
3

Provide the children with writing materials and take them for a walk in the neighborhood to make notes for maps. These notes may be about buildings, lamp posts, traffic lights and signs, parks, park benches, sidewalks and names of streets. Back in the classroom, have the children each label a large sheet of paper north, south, west and east, and refer to the notes taken during the walk to make a map of the neighbourhood. Some children may prefer to work with a partner, while others may prefer to work alone; this will depend largely on their map-making skills. Each map will probably be different, since the children's ideas of what should be marked on a map will vary. When the maps are finished, display them so that the children can compare their work.

4

Have each child or pair of children make up four questions about the map they drew. For example

There is a church two blocks west of



Using a Map

In Action

1. At what corner does Paul live?
   Market and Lake.
2. At what corner does Tom live?
   Hill and Lake.
3. Paul and Tom meet to go swimming.
   Paul has walked 2 blocks north.
   Tom has walked 1 block south.
   On what corner do they meet?
   Lake and Miller.
4. Trace a route Tom might walk to go to the swimming pool. How many blocks would he walk? Answers will vary.
5. Trace a route Paul might walk to go to the pool. How many blocks would he walk?
   Answers will vary.
6. Paul walked 3 blocks East, 3 blocks North and 3 blocks West. On what corner was he?
   Hill and Lake.
7. Paul and Tom agreed to meet on the corner of Ivy and Brown. Write down a route Tom might use to get to that corner.
   Answers will vary.

231

the school and one block north. On what street is the church?
or
There is a bus stop on the corner of Snell Avenue. In what direction will I walk to get there?
Have small groups of children question each other about the maps they have drawn.

5
Have each child write out directions for getting from one location in the neighbourhood to another. The children may enjoy writing out directions to a number of different locations.

Written and Other Activities

☐
mathways 3, page 231
Discuss the map. Explain the letter symbols and recall that north is always at the top of a map, south is always at the bottom, west is always on the left side and east is on the right side. Have children point to various locations on the map and trace with their fingers different routes for getting from one location to another. Provide the children with tracing paper for doing the In Action questions.

☐ ☐
Ask each of the children to draw a map of the immediate vicinity in which her or his home is located. The adults at home might help and it could become a home project. Again, important features such as neighbours' homes, street or highway names, well-known neighbourhood landmarks and so on should be marked on the maps.

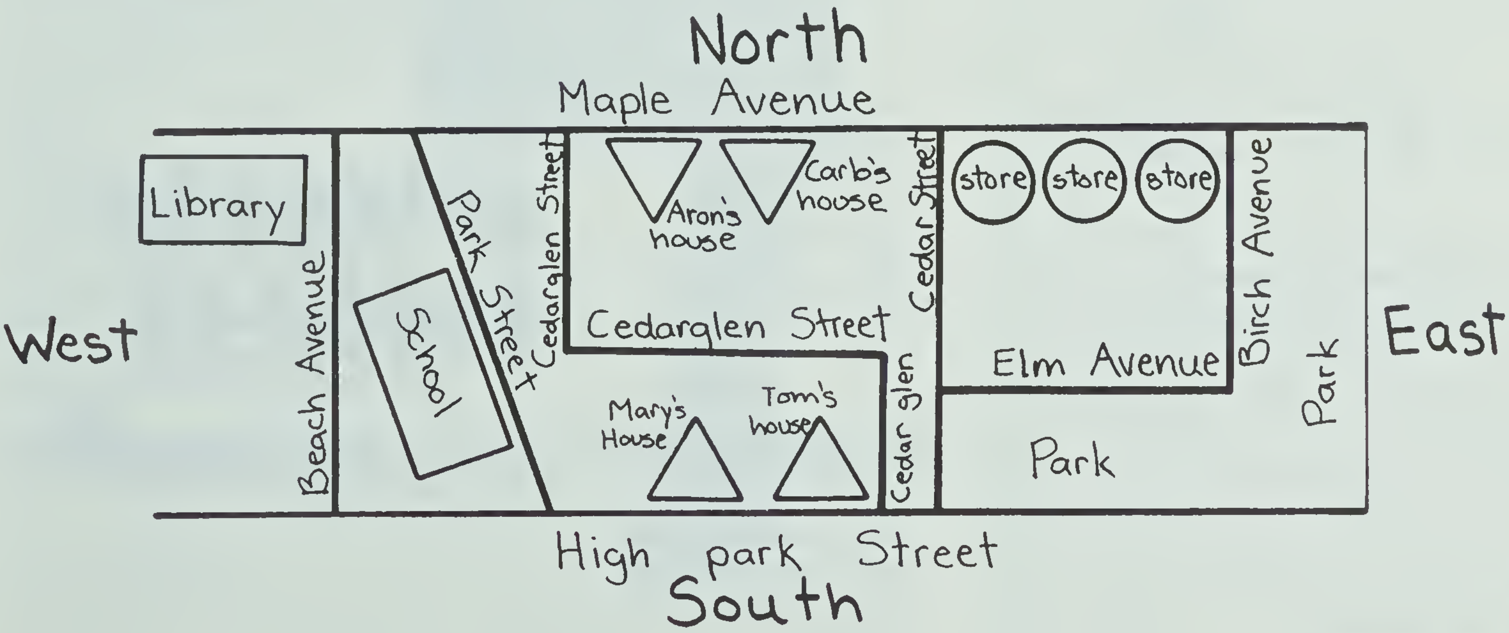
☐ ☐ ☐
Write a note home suggesting that a dinner hour game entitled *Where am I?* be played. Because the game involves directions, of course those have to be established first. The child could actually teach the game at home and could, in class, prepare the first two or three riddles.
I walk out the front door, I walk north, I turn west at the first corner and walk one block. Where am I?

☐ ☐ ☐ ☐
Have groups of three or four children construct a model of their neighbourhood. The model may be constructed on a flat surface, using small pieces of wood, boxes, three-dimensional solids made from paper, toothpicks, buttons, pasta, construction paper and scraps of material to represent various features, for example, buildings. Display the models in the classroom and discuss each.

☐ ☐ ☐ ☐ ☐
Have the children examine a commercial map of the city or village. After discussion, question the children about various features and locations. Children who particularly enjoy the activity can be encouraged to examine a map of a nearby village or city and ask each other questions about it.

☐ ☐ ☐ ☐ ☐ ☐
Small groups of children can play *Where am I?* The leader begins, asking *I left the west door of the school, walked through the school yard to King Street, then walked two blocks north and one block east. Where am I?* The first child to answer correctly is the next leader.

☐ ☐ ☐ ☐ ☐ ☐ ☐
mathways 3 Plus Workbook page 82



Unit 3 Section 7 Lesson 8

Drawing Pictures to Help Solve Problems

Materials

- catalogues, magazines, newspapers
- for each child
  - several 10 cm by 10 cm pieces of construction paper

Rationale

Learning to render numerical and verbal information pictorially helps children to understand and solve problems. The children should be encouraged to use this technique for solving any problem that gives them difficulty. As with any skill, successful application depends upon the number of experiences and opportunities to practise.

Lesson

1

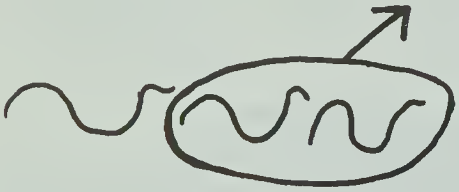
Gather the children around the easel. Write a problem like the following on the easel.

Three birds sat on a fence.
Two flew away.
How many birds are on the fence?

Say

We could use counters to show the birds. Sometimes counters are not available.
We could draw a picture.

Draw an illustration such as the following beside the problem.



Is this a good picture of birds?
Why is it a good picture for the problem?
How does the picture help us solve the problem?
Please draw a picture for this problem.
Five birds sat on the fence.
One flew away.

Discuss the illustrations.

Now draw a picture for this problem.
Seven birds sat on the fence.
Two more birds joined them.
How does your picture for this problem differ from the first bird pictures you drew?

Continue to discuss pictures and to give new "bird" problems until the children begin to feel comfortable illustrating them.

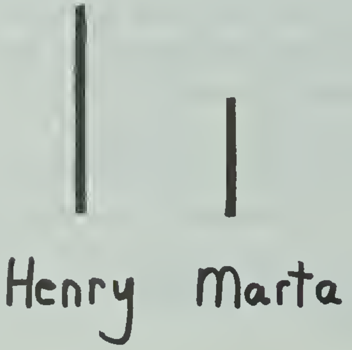
2

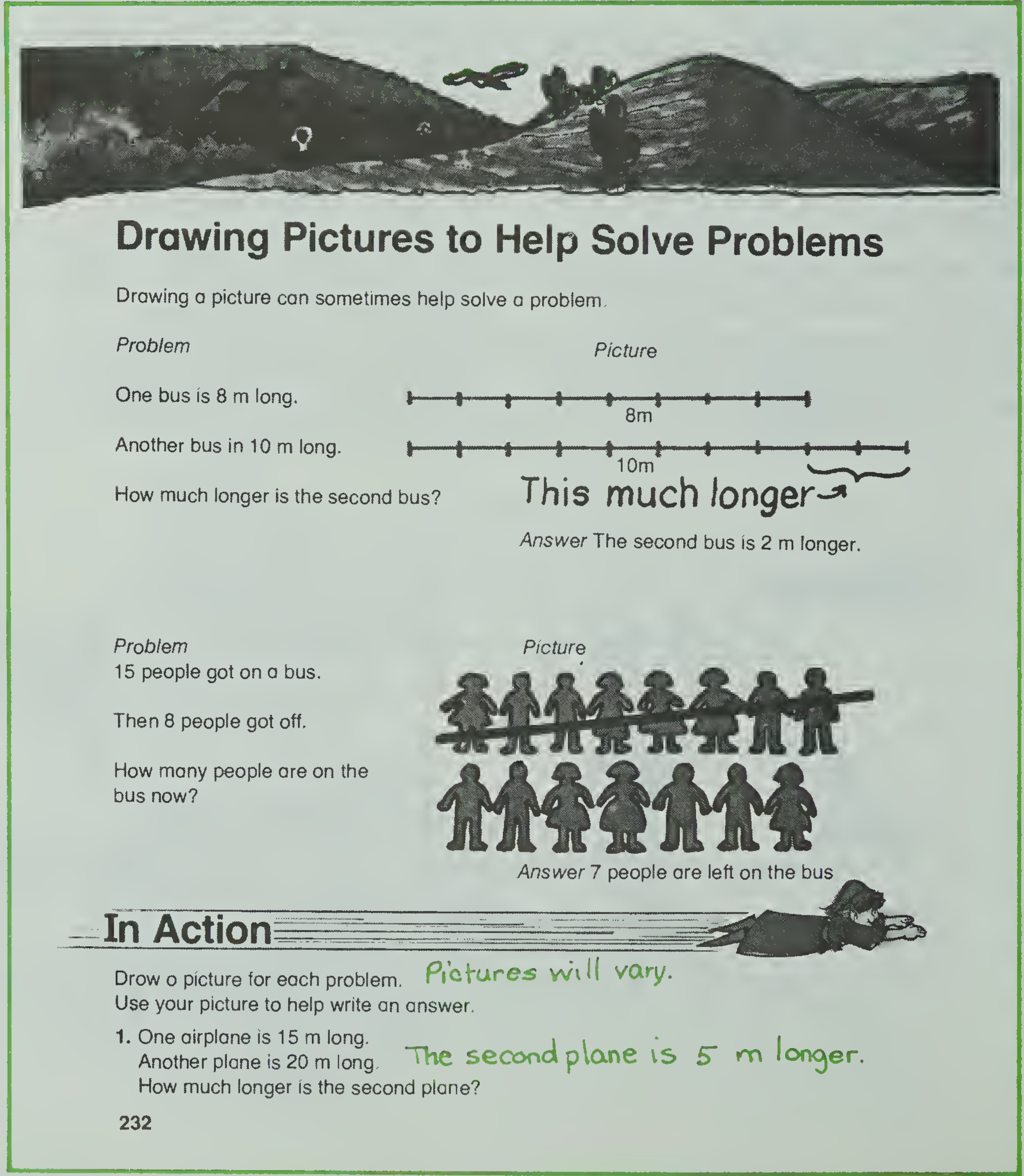
Ask two children having obviously different heights to stand side by side. Discuss this difference encouraging the students to make comparative statements such as these.

Henry is taller than Marta.
Marta is shorter than Henry.

Ask the children to draw a picture showing the heights of the two children. After an appropriate length of time discuss the resulting pictures. Talk about the fact that a very simple line drawing is all that is necessary. Discuss too that sometimes labels on drawings are very important and that this is one of those times.

To help us remember that the longer line represents Henry we write his name under the longer line and Marta's name under the shorter line.





Drawing Pictures to Help Solve Problems

Drawing a picture can sometimes help solve a problem.

Problem	*Picture*
One bus is 8 m long.	8m
Another bus in 10 m long.	10m
How much longer is the second bus?	This much longer
	Answer The second bus is 2 m longer.

Problem	*Picture*
15 people got on a bus.	
Then 8 people got off.	
How many people are on the bus now?	
	Answer 7 people are left on the bus

In Action

Draw a picture for each problem. Pictures will vary.
Use your picture to help write an answer.

1. One airplane is 15 m long.
   Another plane is 20 m long. The second plane is 5 m longer.
   How much longer is the second plane?

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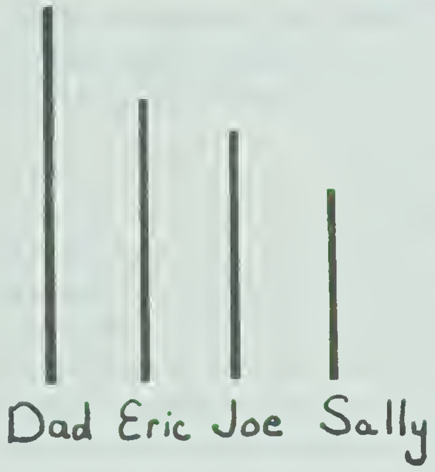
Have two other children stand side by side and this time without any preliminary discussion ask the students to draw and label a picture illustrating the heights of the children. Repeat several times increasing the number of children to three if it seems appropriate.

3

Ask the students to think for a moment about the heights of the members of their families. Have each of the students draw a picture to show their family members.

Discuss each picture with each participant.

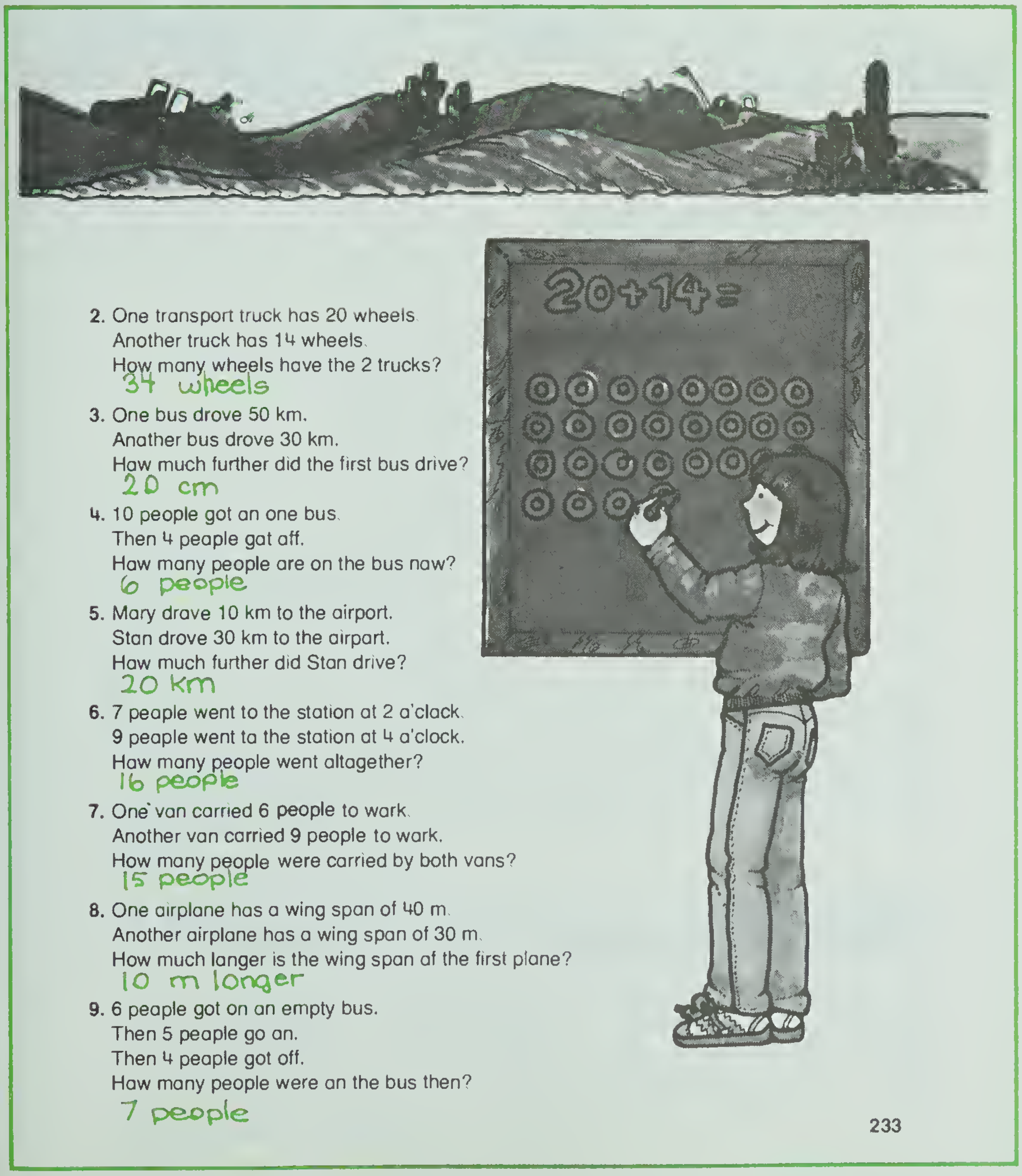


4

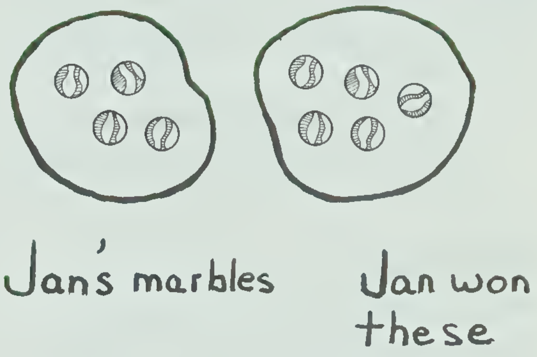
Look at this problem.

Write on the easel:

Jan had 4 marbles
She won 5 more at recess.


2. One transport truck has 20 wheels.
Another truck has 14 wheels.
How many wheels have the 2 trucks?
34 wheels
3. One bus drove 50 km.
Another bus drove 30 km.
How much further did the first bus drive?
20 cm
4. 10 people got on one bus.
Then 4 people got off.
How many people are on the bus now?
6 people
5. Mary drove 10 km to the airport.
Stan drove 30 km to the airport.
How much further did Stan drive?
20 km
6. 7 people went to the station at 2 o'clock.
9 people went to the station at 4 o'clock.
How many people went altogether?
16 people
7. One van carried 6 people to work.
Another van carried 9 people to work.
How many people were carried by both vans?
15 people
8. One airplane has a wing span of 40 m.
Another airplane has a wing span of 30 m.
How much longer is the wing span of the first plane?
10 m longer
9. 6 people got on an empty bus.
Then 5 people go on.
Then 4 people got off.
How many people were on the bus then?
7 people

233



Why is this a good picture for the problem?
How does the picture help us solve the problem?

5

Tell the children to listen carefully, then give them information such as the following:

One team has three players.
Another team has five players.

Ask the children in the group to draw pictures showing this information. Each picture will likely be different from the others.

Referring to the pictures, discuss the fact that different pictures may contain the same information.

Then pose problems.

How many players are on the two teams?
How many more players are there on one team than are on the other team?

Have the children refer to the pictures to help them answer the questions.

Discuss why the picture helps to solve the problem.

Written and Other Activities

☐

mathways 3, pages 232, 233

Have different children read the examples aloud and explain how the pictures help in solving the problem.

☐ ☐

mathways 3 Practice Masters page 54

☐ ☐ ☐

mathways 3 Tests 3A, 3B

☐ ☐ ☐ ☐

mathways 3 Plus Workbook pages 83 and 84

Unit 3 Section 8 Lesson 1

Recalling Multiplication Facts

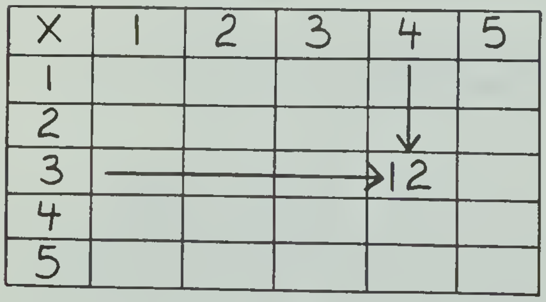
Materials

- wall multiplication chart
- for each child
  - copy of Program Master 21
  - several blank cards for recording facts

Rationale

By this point in the *mathways* program, the children have already had considerable experience with multiplication and division facts to nine. Counting, building equal sets, repeated addition, arranging counters in rows and columns, exploring multiplication charts and pairs of numbers – all of these approaches have formed the basis for previous activities and prepared the children for the more sophisticated exploration of facts presented in this next group of lessons.

Throughout Section 8, lessons are designed to exploit the inverse relationship between multiplication and division to extend and consolidate the children's knowledge of facts. For this purpose, much use is made of the multiplication chart. The children examine each multiplication fact whose product appears along a diagonal. These facts are reviewed together, along with the related division facts. Thus the children learn that most numbers in the body of the chart will yield four facts.



X	1	2	3	4	5
1					
2					
3				12	
4					
5					

3×4 = 12 12 ÷ 4 = 3

4×3 = 12 12 ÷ 3 = 4

The diagonals are then examined to show that they can be used for quickly reviewing related multiplication and division facts.

Providing children with as many approaches as possible helps them to think about facts in many ways and makes the memorization process and the lessons easier and more interesting.

Lesson

1

Gather the children around the easel on which a multiplication chart has been drawn. Ask one or two children to tell what they remember about how the chart shows multiplication and division facts. Point to the square for the row beginning with 5 and the column beginning with 6. Ask different children to state one of the four facts. Write them on the easel.

$5 \times 6 = 30$ $6 \times 5 = 30$

$30 \div 6 = 5$ $30 \div 5 = 6$

Continue the activity, inviting children to point to squares and write the related facts on the easel. Give each child an opportunity to participate.

2

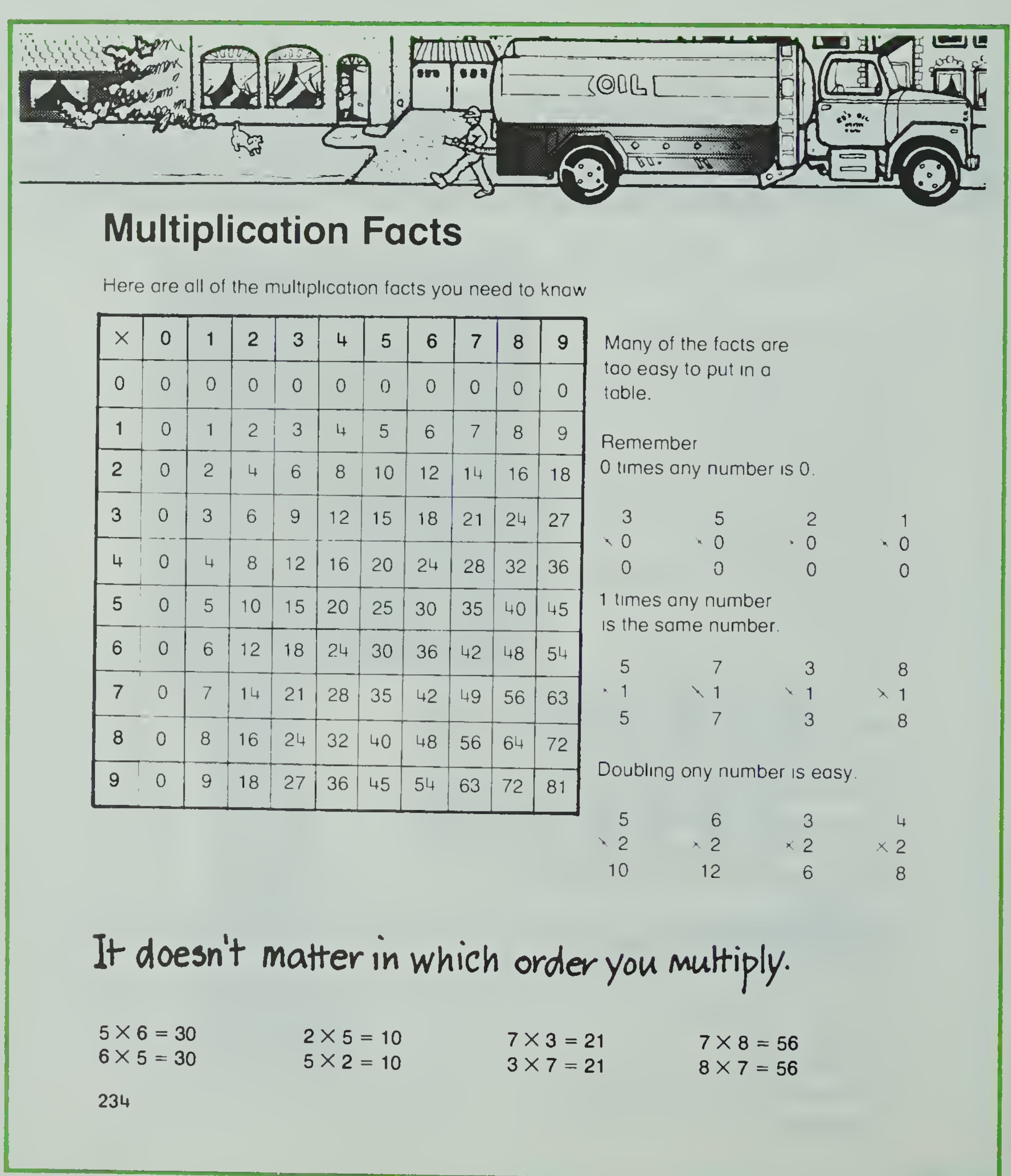
Point to each square in the row beginning with 1 and then to the column for 1. Ask a child to state the multiplication and division sentences for each. Repeat to review the facts of 2.

3

Have children write multiplication sentences for the facts of 2 on the easel and draw pictures of sets to illustrate each fact.

4

Invite each child in a group to think of a multiplication fact of 1 or 2, then use



Multiplication Facts

Here are all of the multiplication facts you need to know

×	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

Many of the facts are too easy to put in a table.

Remember
0 times any number is 0.

$\begin{array}{r}3\\ \times 0\\ 0\end{array}$ $\begin{array}{r}5\\ \times 0\\ 0\end{array}$ $\begin{array}{r}2\\ \times 0\\ 0\end{array}$ $\begin{array}{r}1\\ \times 0\\ 0\end{array}$

1 times any number is the same number.

$\begin{array}{r}5\\ \times 1\\ 5\end{array}$ $\begin{array}{r}7\\ \times 1\\ 7\end{array}$ $\begin{array}{r}3\\ \times 1\\ 3\end{array}$ $\begin{array}{r}8\\ \times 1\\ 8\end{array}$

Doubling any number is easy.

$\begin{array}{r}5\\ \times 2\\ 10\end{array}$ $\begin{array}{r}6\\ \times 2\\ 12\end{array}$ $\begin{array}{r}3\\ \times 2\\ 6\end{array}$ $\begin{array}{r}4\\ \times 2\\ 8\end{array}$

It doesn't matter in which order you multiply.

$5 \times 6 = 30$
$6 \times 5 = 30$

$2 \times 5 = 10$
$5 \times 2 = 10$

$7 \times 3 = 21$
$3 \times 7 = 21$

$7 \times 8 = 56$
$8 \times 7 = 56$

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objects in the room to illustrate the fact. Such objects may be books, pencils, erasers, chairs and so on. The rest of the group guesses the fact being illustrated, and one child points to the square on the multiplication chart.

5

Invite each child in the group to make up a word problem involving a fact of 2 for the others to answer. Give the children an example.

Each box contains nine blocks.
There are two boxes.
How many blocks are there?

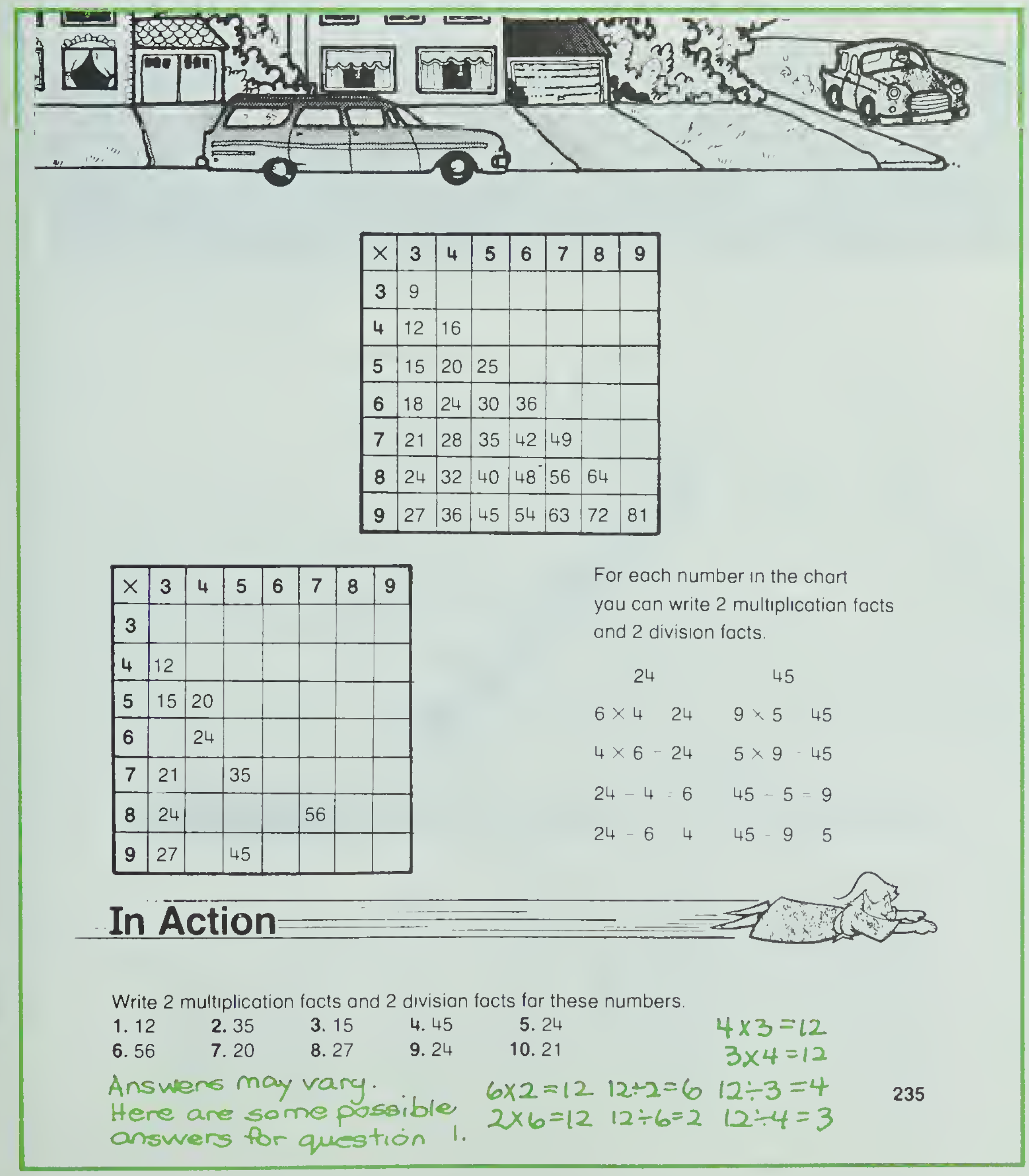
If any children in the group have difficulty, have them draw a picture on the easel to help them solve the problem.

State the related problem.

Each box contains two blocks.
There are nine boxes.
How many blocks are there?

6

Give each child a copy of Program Master 21 on which to record facts that have been learned. The children can write the factors along the top row and side column of the chart and record the numbers as they are shaded in on the wall chart during lessons. To draw attention to facts that they find difficult, products can be looped. For this lesson, the children would record the numbers in the rows and columns for 0, 1 and 2. Encourage the children to keep the charts as a personal inventory of facts they have learned, and to use them for quick review.



×	3	4	5	6	7	8	9
3	9						
4	12	16					
5	15	20	25				
6	18	24	30	36			
7	21	28	35	42	49		
8	24	32	40	48	56	64	
9	27	36	45	54	63	72	81

×	3	4	5	6	7	8	9
3							
4	12						
5	15	20					
6		24					
7	21		35				
8	24				56		
9	27		45				

For each number in the chart you can write 2 multiplication facts and 2 division facts.

24	45
6 × 4 = 24	9 × 5 = 45
4 × 6 = 24	5 × 9 = 45
24 ÷ 4 = 6	45 ÷ 5 = 9
24 ÷ 6 = 4	45 ÷ 9 = 5

In Action

Write 2 multiplication facts and 2 division facts for these numbers.

1. 12 **2.** 35 **3.** 15 **4.** 45 **5.** 24
6. 56 **7.** 20 **8.** 27 **9.** 24 **10.** 21

Answers may vary.
Here are some possible answers for question 1.

4x3=12
3x4=12
6x2=12 12÷2=6 12÷3=4
2x6=12 12÷6=2 12÷4=3

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Written and Other Activities

☐

mathways 3, pages 234, 235

Discuss the charts shown on each page. Then, on the wall chart used during the lesson, colour each square for which 0, 1 and 2 are factors. Involve children in a discussion about why multiplying and dividing by these numbers is easy. Have a child read the information at the bottom of page 234 and explain to the group how this principle reduces the number of facts to be learned.

Tell the children that as the facts of each number are reviewed, the squares on the wall chart will be coloured. Assign the In Action questions.

☐ ☐

Have the children draw pictures of sets to illustrate four of the In Action questions. Have them label each picture with a multiplication and a division sentence.

☐ ☐ ☐

Have the children make pairs of cards such as the following to review facts they find difficult.

Small groups of children can combine their cards to make up a deck of 30 with which to play *Concentration.* The cards are placed faced down on a table. A player takes two cards. If the cards match, the player keeps them and takes two more. If the cards do not match, they are placed face down on the table and the next player takes a turn. When all the cards have been taken, the players count their cards. The player with the greatest number of cards wins the game.

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mathways 3 Practice Masters pages 62 and 63

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mathways 3 Plus Workbook pages 95 and 96

Unit 3 Section 8 Lesson 2
Recalling Multiplication and Division Facts: Products and Dividends on a Diagonal

Materials
- wall multiplication chart

Lesson
1
Gather the children around the multiplication chart. Have a child explain why some of the squares are coloured. Using a contrasting colour, shade in the squares along both diagonals showing the products 12, 30, 42, 56, 72. Pointing to each square, ask

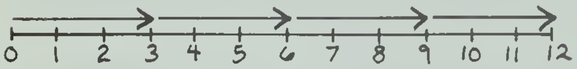
What four number sentences can we write?

Have a child write the sentences on the easel. For example

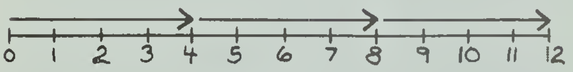
4 × 3 = 12   3 × 4 = 12
12 ÷ 3 = 4   12 ÷ 4 = 3

2
Have the children fill in the squares for products 12, 20, 30, 42, 56, and 72 on their own charts, started during the previous lesson.

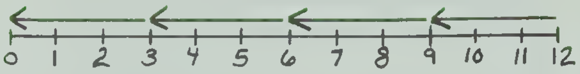
3
Draw a number line on the easel. Demonstrate how a number line can show a multiplication and a division sentence. For multiplication, the first arrow begins at 0; the number of arrows shows the number of sets; the length of each arrow shows the number in each set, and the last arrow shows the product. For division, the first arrow begins at the first number in the division sentence, or the number in the set being divided; the length of each arrow shows the number in each set; the number of arrows shows the number of sets; and the last arrow ends at 0.



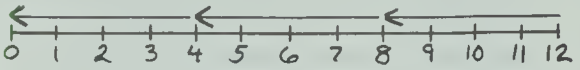
4 × 3 = 12



3 × 4 = 12

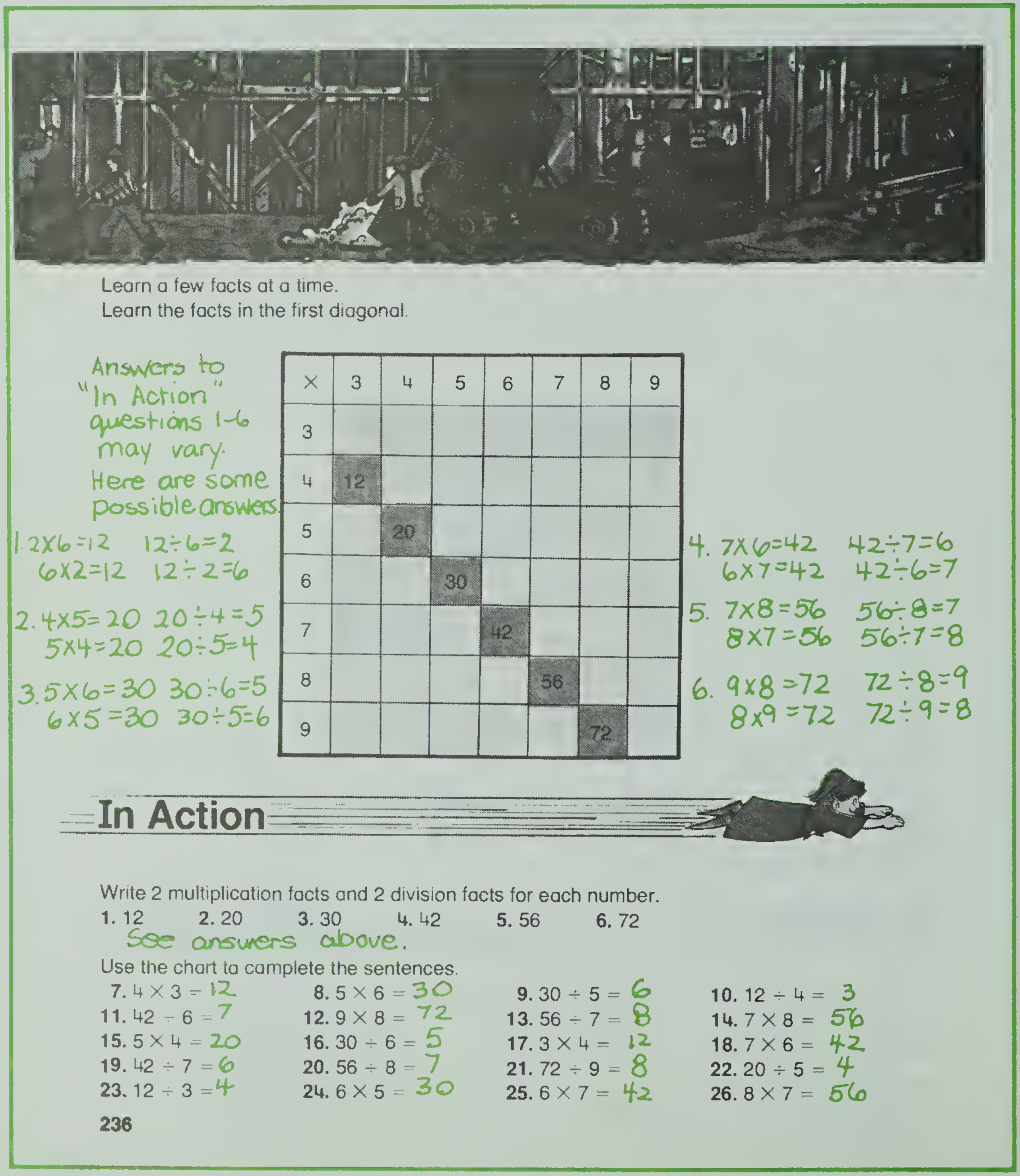


12 ÷ 3 = 4



12 ÷ 4 = 3

Written and Other Activities
☐
mathways 3, page 236
Compare the diagonal shown on the page to the diagonal on the wall chart, emphasizing that both diagonals show the same facts. Ask children to suggest ways in which they can remember the numbers along the diagonal.


Learn a few facts at a time.
Learn the facts in the first diagonal.

Answers to "In Action" questions 1-6 may vary. Here are some possible answers.

×	3	4	5	6	7	8	9
3							
4	12						
5		20					
6			30				
7				42			
8					56		
9						72	

1. 2×6=12   12÷6=2
   6×2=12   12÷2=6
2. 4×5=20   20÷4=5
   5×4=20   20÷5=4
3. 5×6=30   30÷6=5
   6×5=30   30÷5=6
4. 7×6=42   42÷7=6
   6×7=42   42÷6=7
5. 7×8=56   56÷8=7
   8×7=56   56÷7=8
6. 9×8=72   72÷8=9
   8×9=72   72÷9=8

In Action

Write 2 multiplication facts and 2 division facts for each number.
1. 12   2. 20   3. 30   4. 42   5. 56   6. 72
See answers above.

Use the chart to complete the sentences.
7. 4 × 3 = 12   8. 5 × 6 = 30   9. 30 ÷ 5 = 6   10. 12 ÷ 4 = 3
11. 42 ÷ 6 = 7   12. 9 × 8 = 72   13. 56 ÷ 7 = 8   14. 7 × 8 = 56
15. 5 × 4 = 20   16. 30 ÷ 6 = 5   17. 3 × 4 = 12   18. 7 × 6 = 42
19. 42 ÷ 7 = 6   20. 56 ÷ 8 = 7   21. 72 ÷ 9 = 8   22. 20 ÷ 5 = 4
23. 12 ÷ 3 = 4   24. 6 × 5 = 30   25. 6 × 7 = 42   26. 8 × 7 = 56

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Unit 3 Section 8 Lesson 3

Recalling Multiplication and Division Facts

Materials

- wall multiplication chart
- for each child
  - multiplication chart, reproduced from Program Master 24
  - number lines, reproduced from Program Master 30

Lesson

1

Gather the children around the multiplication chart. Review the multiplication and division facts for the squares that are coloured. Then shade in the diagonals 15, 24, 35, 48, 63, using a third colour. Then, as you point to each square, ask a child to state two multiplication and two division facts. Remind the children that each of the two squares having the same number show the same facts.

2

Point to the 5 in the first column of the chart and the 3 in the first row.

Write on the easel

(5, 3)

Ask

What is the answer when these numbers are multiplied?

Point to the product 15 and write on the easel

(3, 5)

What is the answer when these numbers are multiplied?

Tell the children that when they see a pair of numbers, they should try to give the answer quickly, without naming the numbers in the pair. Repeat the procedure.

3

Have the children record 15, 24, 35, 48, and 63 in the appropriate squares of their personal multiplication charts.

Written and Other Activities

☐

mathways 3, page 237

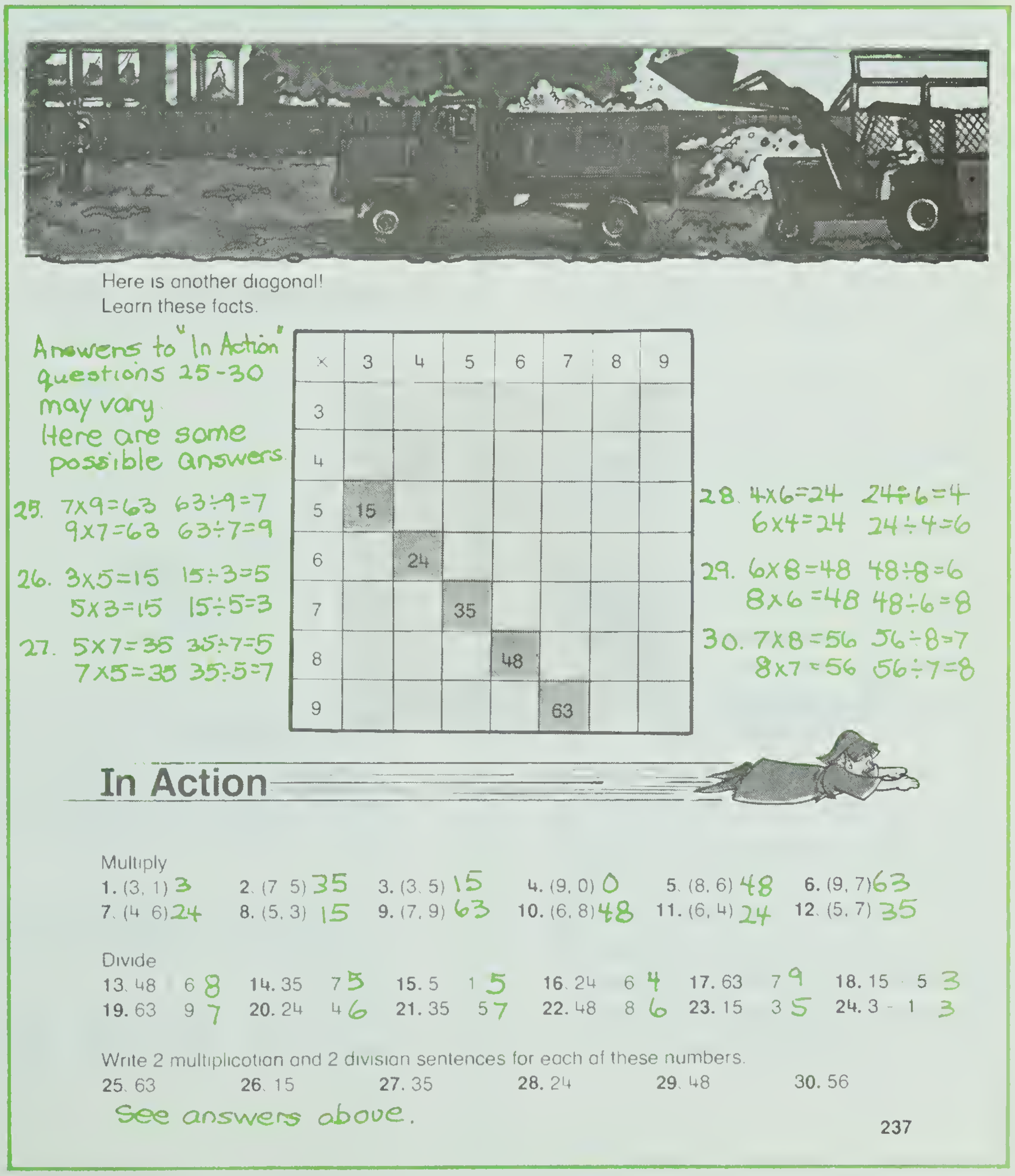
Compare the diagonal shown on the page with the same diagonals shaded in on the wall chart to establish that both show the same multiplication facts.

☐ ☐

Have the children write two multiplication sentences and two division sentences for each of the numbers along the diagonal shown on page 237.

☐ ☐ ☐

Have the children draw arrows on a number line to show several of the multiplication and division facts for the diagonal 15, 24, 35, 48, 63.



Here is another diagonal!
Learn these facts.

Answers to "In Action" questions 25-30 may vary.
Here are some possible answers.

×	3	4	5	6	7	8	9
3							
4							
5	15						
6		24					
7			35				
8				48			
9					63		

25. 7x9=63 63÷9=7
9x7=63 63÷7=9

26. 3x5=15 15÷3=5
5x3=15 15÷5=3

27. 5x7=35 35÷7=5
7x5=35 35÷5=7

28. 4x6=24 24÷6=4
6x4=24 24÷4=6

29. 6x8=48 48÷8=6
8x6=48 48÷6=8

30. 7x8=56 56÷8=7
8x7=56 56÷7=8

In Action

Multiply

1. (3, 1) 3 2. (7 5) 35 3. (3, 5) 15 4. (9, 0) 0 5. (8, 6) 48 6. (9, 7) 63
7. (4 6) 24 8. (5, 3) 15 9. (7, 9) 63 10. (6, 8) 48 11. (6, 4) 24 12. (5, 7) 35

Divide

13. 48 6 8 14. 35 7 5 15. 5 1 5 16. 24 6 4 17. 63 7 9 18. 15 · 5 3
19. 63 9 7 20. 24 4 6 21. 35 5 7 22. 48 8 6 23. 15 3 5 24. 3 - 1 3

Write 2 multiplication and 2 division sentences for each of these numbers.

25. 63 26. 15 27. 35 28. 24 29. 48 30. 56

See answers above.

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Unit 3 Section 8 Lesson 4

Recalling Multiplication and Division Facts: Diagonals, Number Pairs

Materials

- wall multiplication chart
- counters
- for each child
  - multiplication chart, reproduced from Program Master 24

Lesson

1

Gather the children around the multiplication chart. Review multiplication and division facts for the squares already shaded in. Using a contrasting colour, shade the squares along the diagonals 18, 28, 40, 54 and 21, 32, 45.

Point to each square and ask a child to state two multiplication and two division facts. Continue until all the relevant facts have been reviewed.

2

Have the children write in the numbers 18, 28, 40, 54, 21, 32 and 45 on their personal multiplication charts.

3

Write the following diagonal numbers on the easel:

1. 32	*2. 45*	*3. 28*
4. 18	*5. 54*	*6. 21*
7. 24	*8. 35*	*9. 40*

Have a different child write two multiplication sentences and two division sentences for each number on the easel.

4

Have children draw pictures on the easel to illustrate several of the numbers facts indicated on the diagonal being reviewed.

5

Have groups of children use counters to show number facts. Each child in the group thinks of a fact and arranges counters in sets to illustrate it. The other children in the group guess the fact, writing the four related number sentences on paper. The children compare the sentences they have written to check their work.

Written and Other Activities

☐

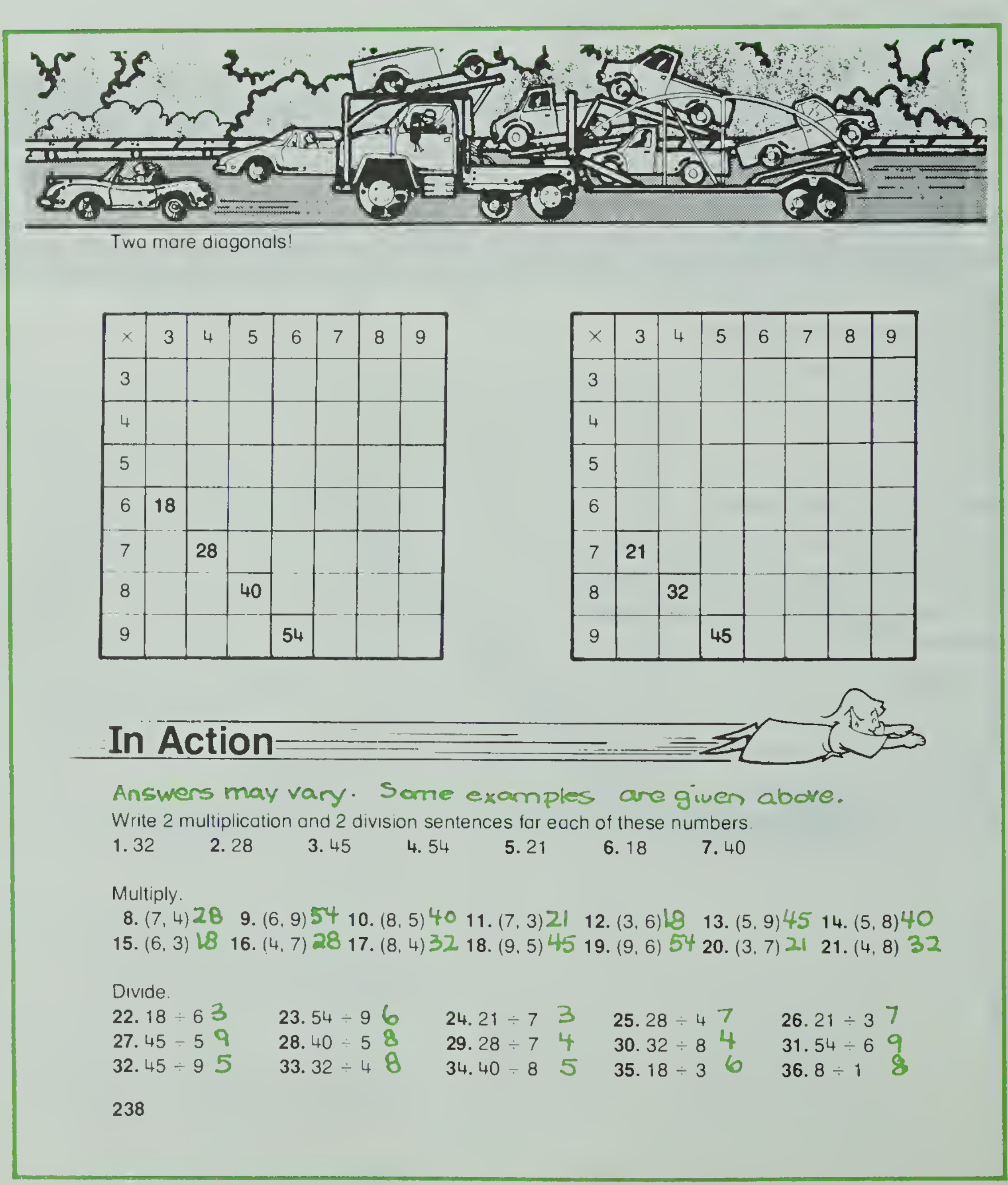
mathways 3, page 238
Compare the diagonals shown with the corresponding diagonals on the wall chart. Ask the children what patterns they notice that could help in remembering the numbers along these diagonals. Assign the In Action questions.

☐ ☐

Have the children write two multiplication sentences for each of the questions 22 to 36 on page 238.
18 ÷ 6 = 3   3 × 6 = 18   6 × 3 = 18

Additional Answers

1. 4×8=32   32÷4=8
   8×4=32   32÷8=4
2. 4×7=28   28÷7=4
   7×4=28   28÷4=7
3. 9×5=45   45÷9=5
   5×9=45   45÷5=9
4. 9×6=54   54÷6=9
   6×9=54   54÷9=6
5. 3×7=21   21÷7=3
   7×3=21   21÷3=7
6. 2×9=18   18÷2=9
   9×2=18   18÷9=2
7. 8×5=40   40÷5=8
   5×8=40   40÷8=5



Two more diagonals!

×	3	4	5	6	7	8	9
3							
4							
5							
6	18						
7		28					
8			40				
9				54			

×	3	4	5	6	7	8	9
3							
4							
5							
6							
7	21						
8		32					
9			45				

In Action

Answers may vary. Some examples are given above.

Write 2 multiplication and 2 division sentences for each of these numbers.
1. 32 **2.** 28 **3.** 45 **4.** 54 **5.** 21 **6.** 18 **7.** 40

Multiply.
8. (7, 4) 28 **9.** (6, 9) 54 **10.** (8, 5) 40 **11.** (7, 3) 21 **12.** (3, 6) 18 **13.** (5, 9) 45 **14.** (5, 8) 40
15. (6, 3) 18 **16.** (4, 7) 28 **17.** (8, 4) 32 **18.** (9, 5) 45 **19.** (9, 6) 54 **20.** (3, 7) 21 **21.** (4, 8) 32

Divide.
22. 18 ÷ 6 3 **23.** 54 ÷ 9 6 **24.** 21 ÷ 7 3 **25.** 28 ÷ 4 7 **26.** 21 ÷ 3 7
27. 45 ÷ 5 9 **28.** 40 ÷ 5 8 **29.** 28 ÷ 7 4 **30.** 32 ÷ 8 4 **31.** 54 ÷ 6 9
32. 45 ÷ 9 5 **33.** 32 ÷ 4 8 **34.** 40 ÷ 8 5 **35.** 18 ÷ 3 6 **36.** 8 ÷ 1 8

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Unit 3 Section 8 Lesson 5

Recalling Multiplication and Division Facts: Diagonals

Materials

- wall multiplication chart
- for each child
  - blank playing cards for making flash cards
- for each group
  - counters

Lesson

1

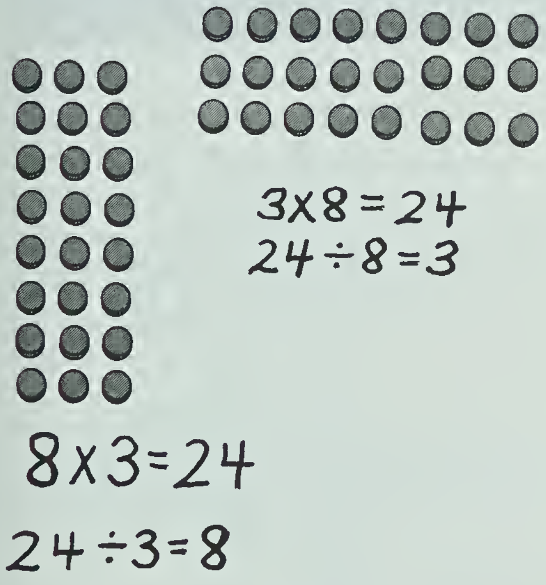
Gather the children around the multiplication chart. Review several of the facts for squares already shaded in. Then shade the squares for 24, 36, 27 in a contrasting colour. Have different children in the group state the four relevant facts for each square.

2

Write on the easel

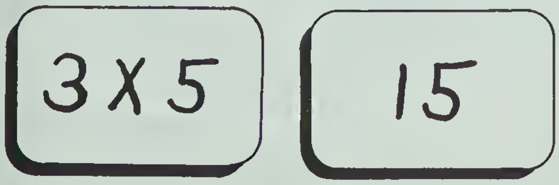
8 × 3 *9 × 4* *9 × 3*

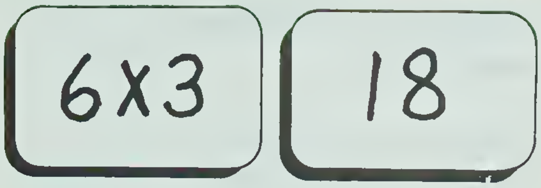
Have the children draw an array of counters in rows and columns for each and write the four relevant number sentences.



3

Have each child use commercial blank playing cards or pieces of cardboard cut to size to record facts he or she finds difficult. The children record the expression on one side and the answer on the reverse side.





Each day, have pairs of children use the cards to drill each other for a short period. If there are more than 10 cards in the deck, break the set into suitable learning units.

Written and Other Activities

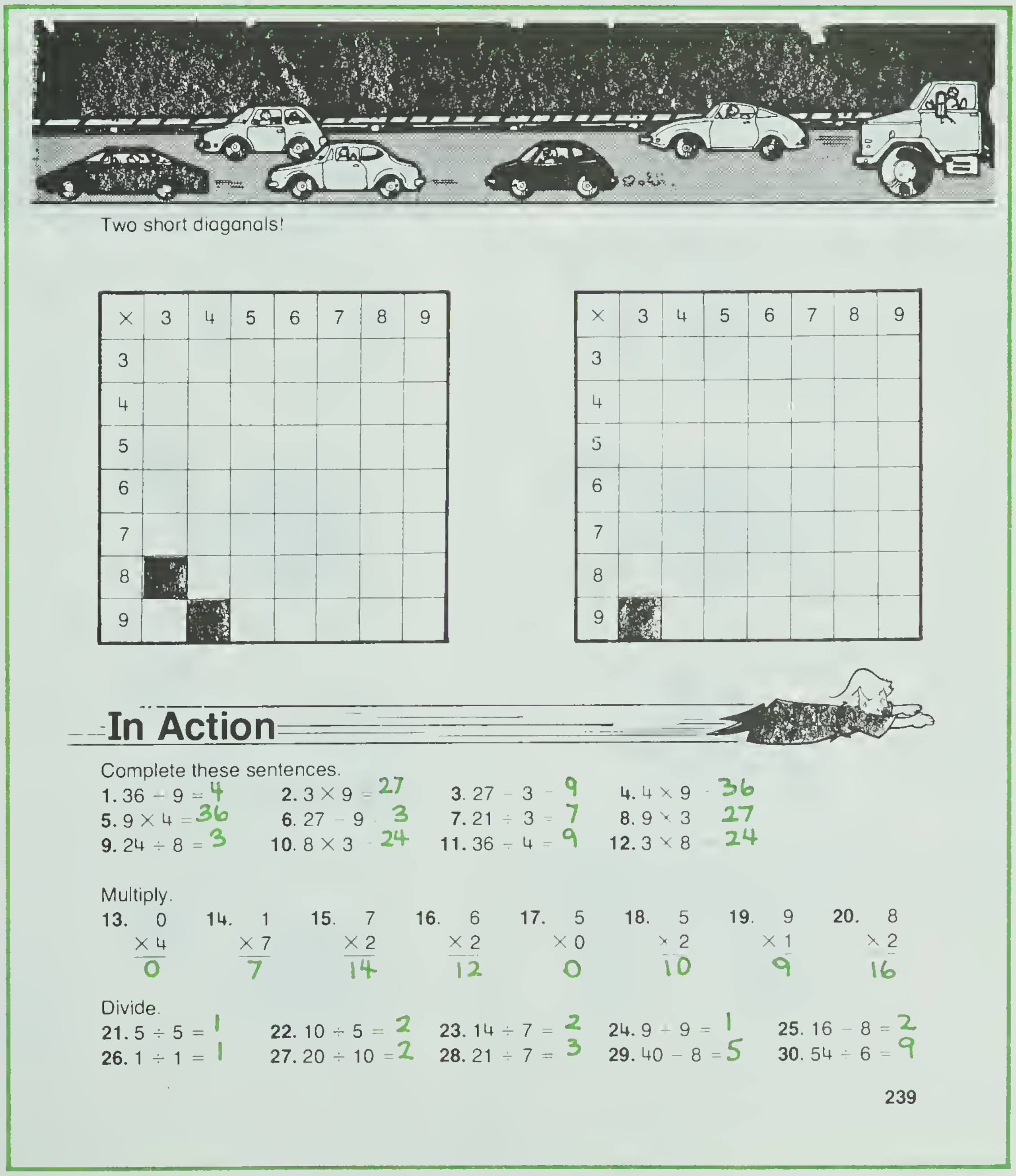
☐

mathways 3, page 239

Compare the diagonals shown in the examples with the same diagonals on the wall chart to emphasize that they show the same facts. Assign the In Action questions.

☐ ☐

Have groups of children use counters to illustrate the facts along the two diagonals being reviewed. Each child thinks of a secret fact, then arranges the counters in the appropriate number of sets. The other children guess the fact and write on paper four sentences and two number pairs. The children exchange papers to check their work.



Two short diagonals!

×	3	4	5	6	7	8	9
3							
4							
5							
6							
7							
8	▨						
9		▨					

×	3	4	5	6	7	8	9
3							
4							
5							
6							
7							
8							
9	▨						

In Action

Complete these sentences.

1. 36 ÷ 9 = 4 **2.** 3 × 9 = 27 **3.** 27 ÷ 3 = 9 **4.** 4 × 9 = 36
5. 9 × 4 = 36 **6.** 27 ÷ 9 = 3 **7.** 21 ÷ 3 = 7 **8.** 9 × 3 = 27
9. 24 ÷ 8 = 3 **10.** 8 × 3 = 24 **11.** 36 ÷ 4 = 9 **12.** 3 × 8 = 24

Multiply.

13. $\begin{array}{r}0\\ \times 4\\ \hline 0\end{array}$ **14.** $\begin{array}{r}1\\ \times 7\\ \hline 7\end{array}$ **15.** $\begin{array}{r}7\\ \times 2\\ \hline 14\end{array}$ **16.** $\begin{array}{r}6\\ \times 2\\ \hline 12\end{array}$ **17.** $\begin{array}{r}5\\ \times 0\\ \hline 0\end{array}$ **18.** $\begin{array}{r}5\\ \times 2\\ \hline 10\end{array}$ **19.** $\begin{array}{r}9\\ \times 1\\ \hline 9\end{array}$ **20.** $\begin{array}{r}8\\ \times 2\\ \hline 16\end{array}$

Divide.

21. 5 ÷ 5 = 1 **22.** 10 ÷ 5 = 2 **23.** 14 ÷ 7 = 2 **24.** 9 ÷ 9 = 1 **25.** 16 ÷ 8 = 2
26. 1 ÷ 1 = 1 **27.** 20 ÷ 10 = 2 **28.** 21 ÷ 7 = 3 **29.** 40 ÷ 8 = 5 **30.** 54 ÷ 6 = 9

239

Unit 3 Section 8 Lesson 6

Recalling Multiplication and Division Facts

Materials

- wall multiplication chart
- for each child
  - blank playing cards

Rationale

The diagonal reviewed on page 240 is special. For each number in the diagonal, the factor in the row is the same as the factor in the column; there is only one multiplication fact and one division fact for each. For example, for 9 the facts are 3 × 3 = 9 and 9 ÷ 3 = 3.

Lesson

1

Gather the children around the multiplication chart. Ask for two multiplication facts and two division facts for a few of the squares already shaded. Shade the squares for 1, 4, 9, 16, 25, 36, 49, 64, and 81 with another colour. Say that these are squares being reviewed in this lesson. Point to the square for 16 and ask for a multiplication fact and a division fact. Explain that there is only one multiplication fact and one division fact for 16. Repeat this for each of the squares shaded during this lesson.

2

Have the children write the numbers 1, 4, 9, 16, 25, 36, 49, 64, and 81 in the appropriate squares of their personal multiplication charts. Tell the children to draw one picture with rows and columns for each multiplication fact reviewed in this lesson. Have them label each picture with one multiplication sentence, one division sentence.

3

The children can add more cards to their personal sets of flash cards and work in pairs to help each other.

Written and Other Activities

☐

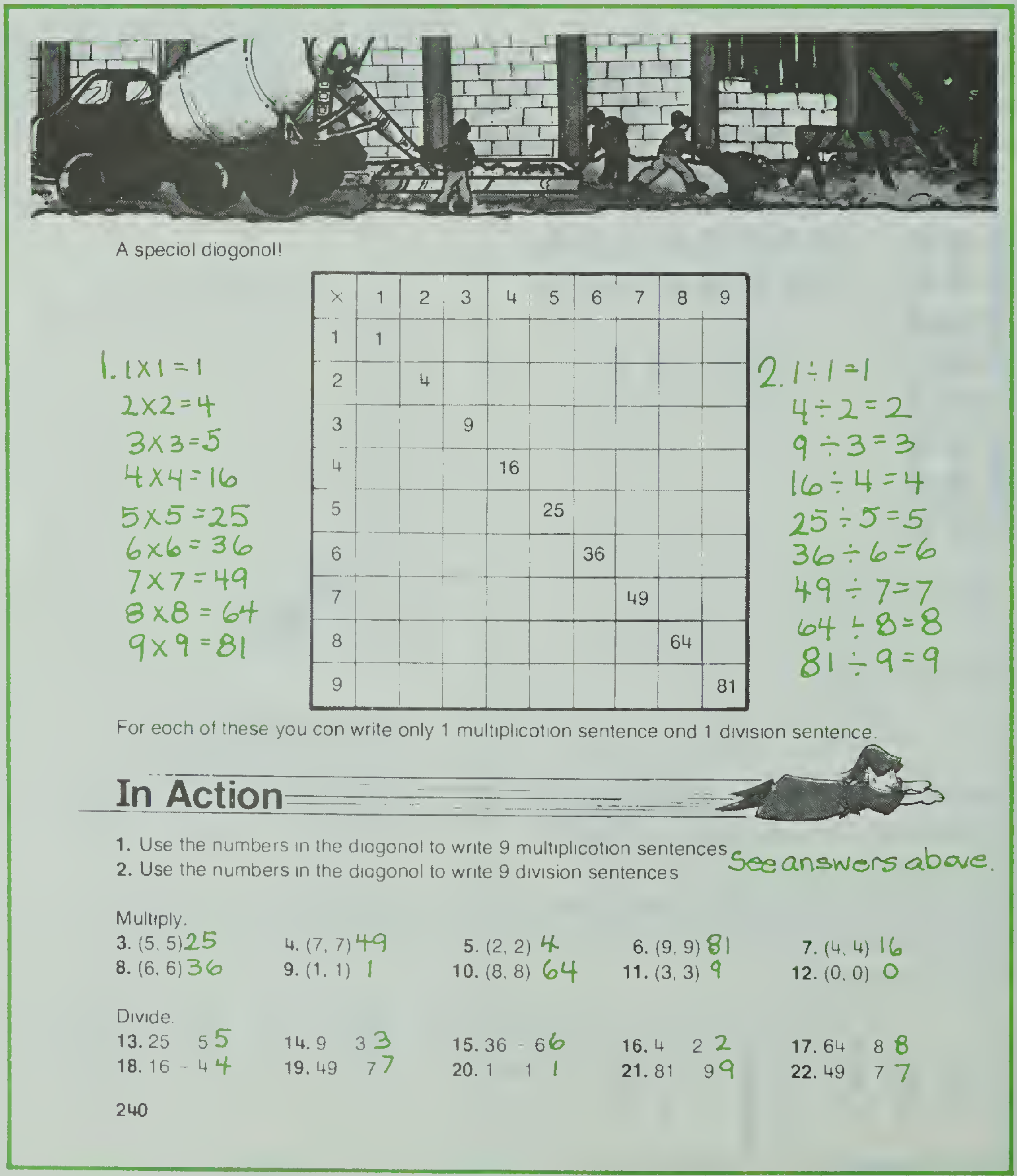
mathways 3, page 240

Point out that there is only one new diagonal shaded in the wall chart and that this is the same as the diagonal on pupil page 240. Ask the children how they can remember the numbers along this diagonal.

Assign the In Action questions.

☐ ☐

mathways 3 Plus Workbook page 85



A special diagonal!

×	1	2	3	4	5	6	7	8	9
1	1								
2		4							
3			9						
4				16					
5					25				
6						36			
7							49		
8								64	
9									81

1. 1x1=1
2x2=4
3x3=5
4x4=16
5x5=25
6x6=36
7x7=49
8x8=64
9x9=81

2. 1÷1=1
4÷2=2
9÷3=3
16÷4=4
25÷5=5
36÷6=6
49÷7=7
64÷8=8
81÷9=9

For each of these you can write only 1 multiplication sentence and 1 division sentence.

In Action

1. Use the numbers in the diagonal to write 9 multiplication sentences
2. Use the numbers in the diagonal to write 9 division sentences

See answers above.

Multiply.

3. (5, 5) 25
4. (7, 7) 49
5. (2, 2) 4
6. (9, 9) 81
7. (4, 4) 16
8. (6, 6) 36
9. (1, 1) 1
10. (8, 8) 64
11. (3, 3) 9
12. (0, 0) 0

Divide.

13. 25 ÷ 5 5
14. 9 ÷ 3 3
15. 36 ÷ 6 6
16. 4 ÷ 2 2
17. 64 ÷ 8 8
18. 16 ÷ 4 4
19. 49 ÷ 7 7
20. 1 ÷ 1 1
21. 81 ÷ 9 9
22. 49 ÷ 7 7

240

Unit 3 Section 8 Lesson 7

PROBLEM SOLVING

Solving Multiplication Problems

Materials

- for each child
  - copy of stencil

Lesson

1

This lesson may help make the children aware of multiplication situations that they encounter every day.

Gather the children around the working area. Encourage each child to tell about an experience when setting the table for different meals, for guests, for special occasions, for picnics and so on. Then ask questions such as *If each person is given one spoon, how many spoons do you need for four people?*

If each person gets three plates, how many plates do you need for five people?

Repeat for several situations.

2

Discuss other situations common to the children's experience. Some examples are boxes, each containing equal numbers of items such as Christmas ornaments, chocolates and so on; chairs, each with four legs; and bicycles, each having two wheels. The children may enjoy illustrating some of these objects and displaying the pictures.

3

Prepare a stencil with division problems such as the following for the children to solve, and give each child a copy.

1. *25 cups*
    5 cups for each table
   How many tables?
2. *24 knives*
    6 knives in each box
   How many boxes?
3. *36 children*
    6 children at each table
   How many tables?
4. *56 spoons*
    7 spoons for each family
   How many families?
5. *81 flowers*
    9 flowers on each table
   How many tables?
6. *32 chairs*
    4 chairs at each table
   How many tables?

The children may enjoy illustrating a few of the problems.

Written and Other Activities

☐

mathways 3, page 241

☐ ☐

Have groups of children challenge each other with story problems. Tell them to listen carefully, then start the activity off with an example such as the following:

All my uncles, aunts and cousins came to our house for Christmas dinner.
Uncle Pat and Aunt Mary came with Kevin, Mark and Brian.
Uncle David and Aunt Terry came with Katherine, Elaine and Nicole.
Uncle Joe and Aunt Thia came with Joan, Michael and Susan.
Uncle Dennis and Aunt Doris came with James, Pamela and Valerie.
There are five in my family.
How many chairs did we need around the dinner table?

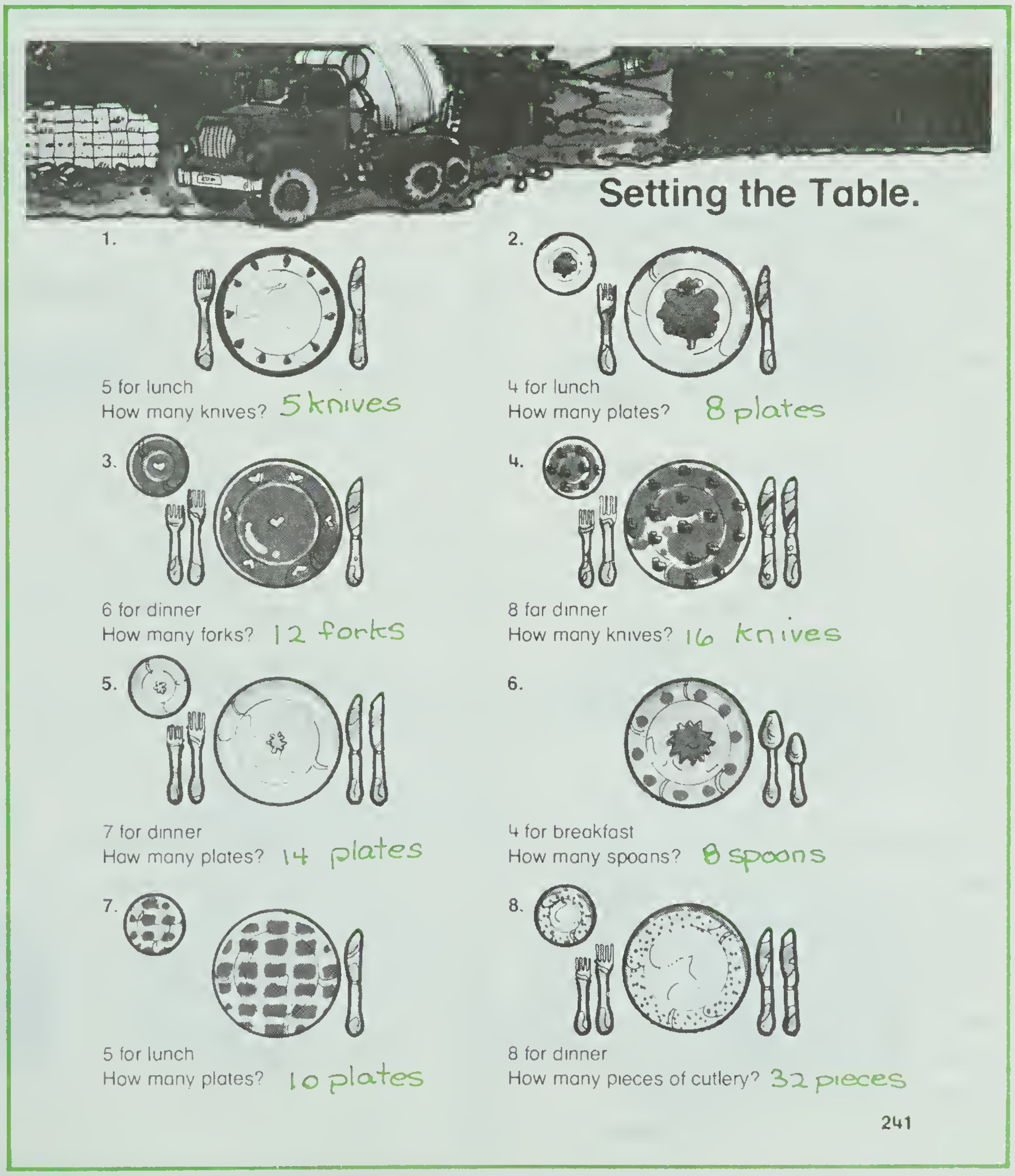
Have each child tell a similar story involving a secret multiplication fact. The children may wish to keep count of the sets on paper.

☐ ☐ ☐

mathways 3 Practice Masters pages 55 and 56

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 86



Setting the Table.

1. 5 for lunch
How many knives? 5 knives

2. 4 for lunch
How many plates? 8 plates

3. 6 for dinner
How many forks? 12 forks

4. 8 for dinner
How many knives? 16 knives

5. 7 for dinner
How many plates? 14 plates

6. 4 for breakfast
How many spoons? 8 spoons

7. 5 for lunch
How many plates? 10 plates

8. 8 for dinner
How many pieces of cutlery? 32 pieces

241

Unit 3 Section 9 Lesson 1

Byway: Recalling Three-Dimensional Solids

Materials

- three-dimensional solids: cube, prism, cone, cylinder, sphere
- for each group of five children
  - – sheet of chart paper

Rationale

Earlier in *mathways 3,* the children explored the properties of three-dimensional solids and compared each with objects commonly seen in the environment. This lesson consolidates and extends the children's knowledge. Displaying the solids for several days at the activity centre would give the children an opportunity to experiment and rediscover characteristics that may have been forgotten.

Lesson

1

Gather the children around the activity centre, where the solids are on display. Ask children questions such as

Nick, do you remember which of these solids is called a sphere?

What common things can you think of that are shaped like a sphere?

Can you describe a sphere for us?

The response might be that a sphere has no edges or vertices, and that it rolls.

Repeat, discussing each of the other solids in the display.

2

Point to each solid in turn, and ask

What is this solid called?

How many faces does it have?

Does this solid have a curved edge?

Allow the children time to experiment with each solid. Instruct them to record the properties of each.

3

Divide the class into five groups. Give each group a sheet of chart paper on which is written the name of a solid. Each group member writes the name of an object that resembles the solid and draws an illustration on the chart paper. The activity should yield five charts, each of which contains illustrations for several different objects resembling the assigned solid. Display these charts at the activity centre.

4

Use each of the charts created for activity 3 as the basis for discussion. Take 10 children at a time to the activity centre, selecting to make sure that two full groups of chartmakers are present. Have the two groups explain to each other the characteristics of the solid they worked with and relate these characteristics to those of the illustrated objects. Note any differences. Then have the children discuss the remaining charts and comment on the characteristics shared by the solids and the illustrated objects.

Written and Other Activities

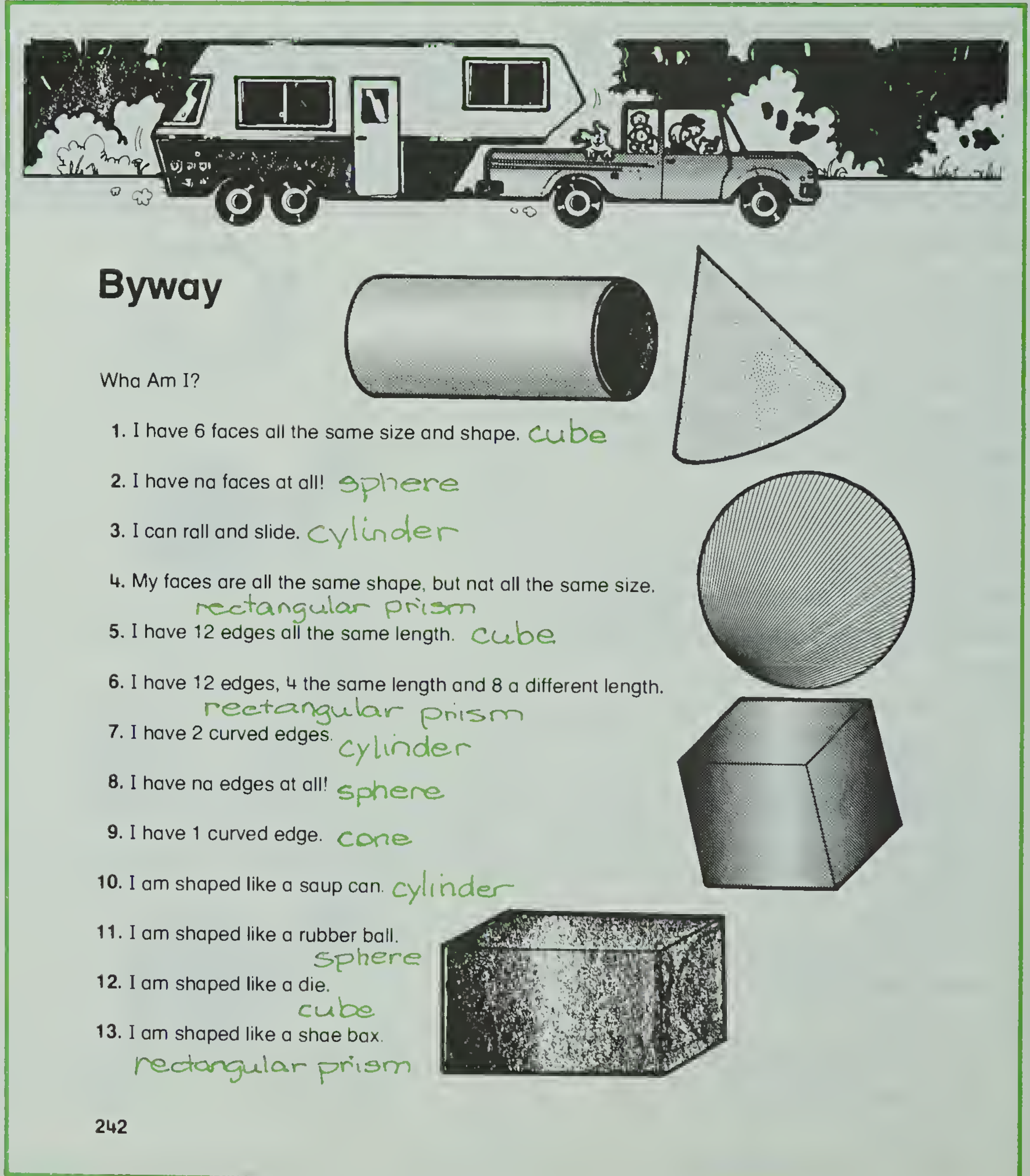
☐

mathways 3, page 242

Before assigning the page, write the name of each solid on the easel. Encourage the children to handle the solids on display if they need to in order to answer the questions.

☐ ☐

Have small groups of children play *Who Am I?* One child begins by naming several characteristics, then asking *Who am I?* The first group member to identify the solid becomes the next leader. As the children play, move from group to group and participate, so that the children will have a model for framing questions.



Byway

Who Am I?

1. I have 6 faces all the same size and shape. cube
2. I have no faces at all! sphere
3. I can roll and slide. cylinder
4. My faces are all the same shape, but not all the same size. rectangular prism
5. I have 12 edges all the same length. cube
6. I have 12 edges, 4 the same length and 8 a different length. rectangular prism
7. I have 2 curved edges. cylinder
8. I have no edges at all! sphere
9. I have 1 curved edge. cone
10. I am shaped like a soup can. cylinder
11. I am shaped like a rubber ball. sphere
12. I am shaped like a die. cube
13. I am shaped like a shoe box. rectangular prism

242

Unit 3 Section 9 Lesson 2

Estimating and Measuring Capacity: The Millilitre

Materials

- for the measurement centre
  - containers having capacities of 1 L, 100 mL, 10 mL
  - assorted containers having various, undetermined capacities
  - 1 mL measuring spoon
  - water, sand, rice or similar pourable substance
- activity cards, *see* ☐ ☐
- for each child
  - blank card to make an activity card

Rationale

Although Grade Three children are not expected to convert measurements from one unit to another, making comparisons is useful in helping them to comprehend the standard units and develop the skills of estimating and measuring. Set up a measurement centre with the materials listed above. The children can bring most of the containers from home. If the centre is set up several days in advance of the lessons, the children can experiment with the materials and thus become familiar with the concept of capacity again before becoming involved in the more structured activities that constitute the lessons and follow-up work. The measuring centre is a natural place to present the lessons and is a strong motivating factor for group and independent work.

Lesson

1

Gather the children around the measurement centre. Show a 1 L container. Write the word *litre* and the symbol L on the easel.

Ask

Jean, can you point out a container whose capacity is about 1 L?

How can you check to be sure?

Have the child fill the container with water and pour it into the 1 L container to verify the estimate. Point to another container.

Mike, would you say the capacity of this container is greater than or less than 1 L?

Check your estimate, please.

Repeat several times, giving each child in the group an opportunity to estimate and measure.

Discuss containers at home which hold about 1 L.

2

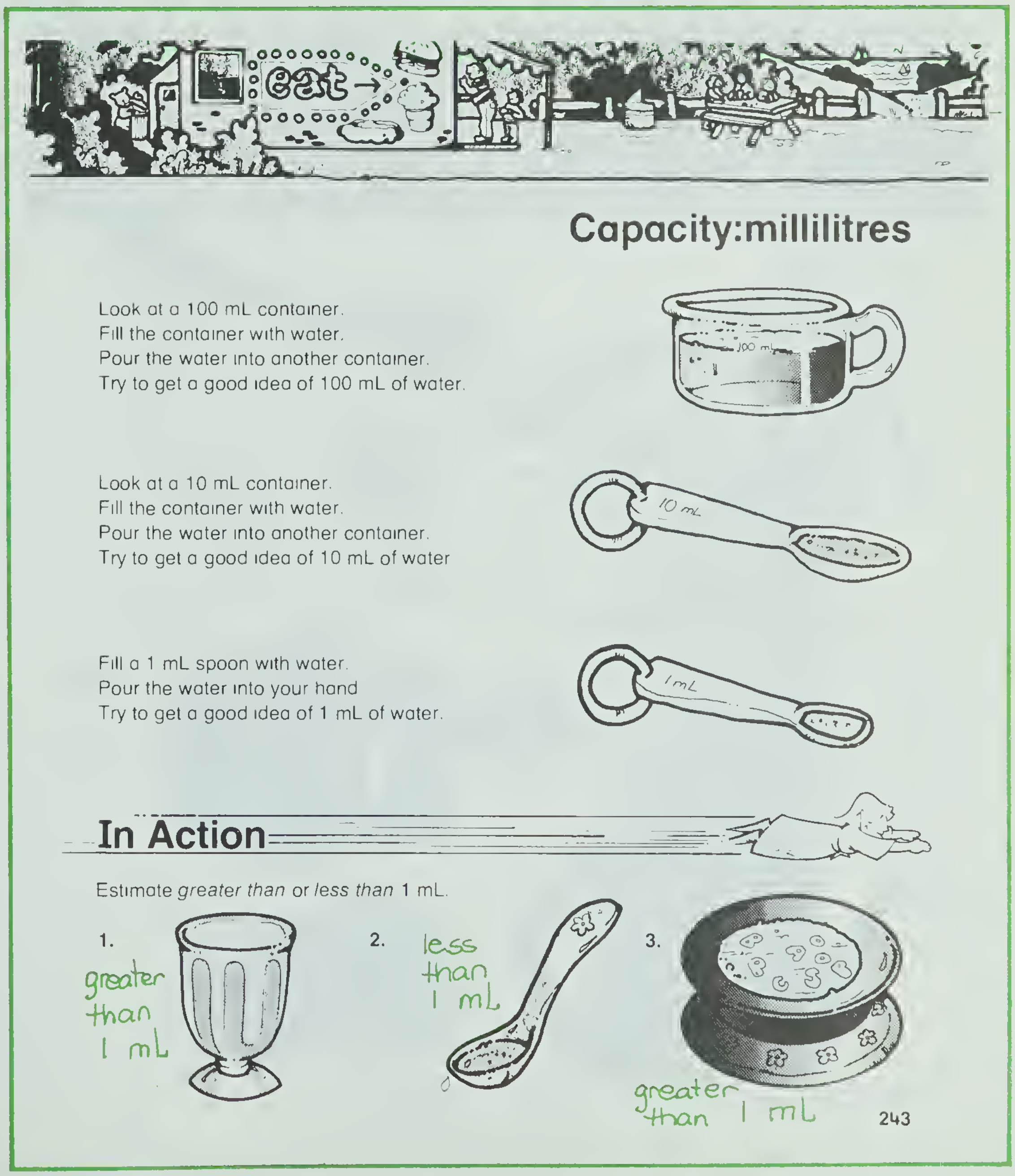
Show and name the 100 mL container, and write mL and *millilitre* on the easel. Have a child fill the 100 mL container with water and pour it into the 1 L container and continue in this fashion until the 1 L container has been filled.

How many times did we fill the 100 mL *container in order to fill the 1* L *container? Tell us, please, Aaron.*

Discuss familiar containers which hold about 100 mL.

3

Show and name the 10 mL container, and write the word and the symbol on the easel. Have the 10 children take a turn at filling the 10 mL container and pouring the contents into the 100 mL container. Have a child tell how many pourings were necessary to fill the 100 mL container with water. Discuss familiar containers such as spoons which hold about 10 mL.



Capacity:millilitres

Look at a 100 mL container.
Fill the container with water.
Pour the water into another container.
Try to get a good idea of 100 mL of water.

Look at a 10 mL container.
Fill the container with water.
Pour the water into another container.
Try to get a good idea of 10 mL of water

Fill a 1 mL spoon with water.
Pour the water into your hand
Try to get a good idea of 1 mL of water.

In Action

Estimate *greater than* or *less than* 1 mL.

1. greater than 1 mL
2. less than 1 mL
3. greater than 1 mL

243

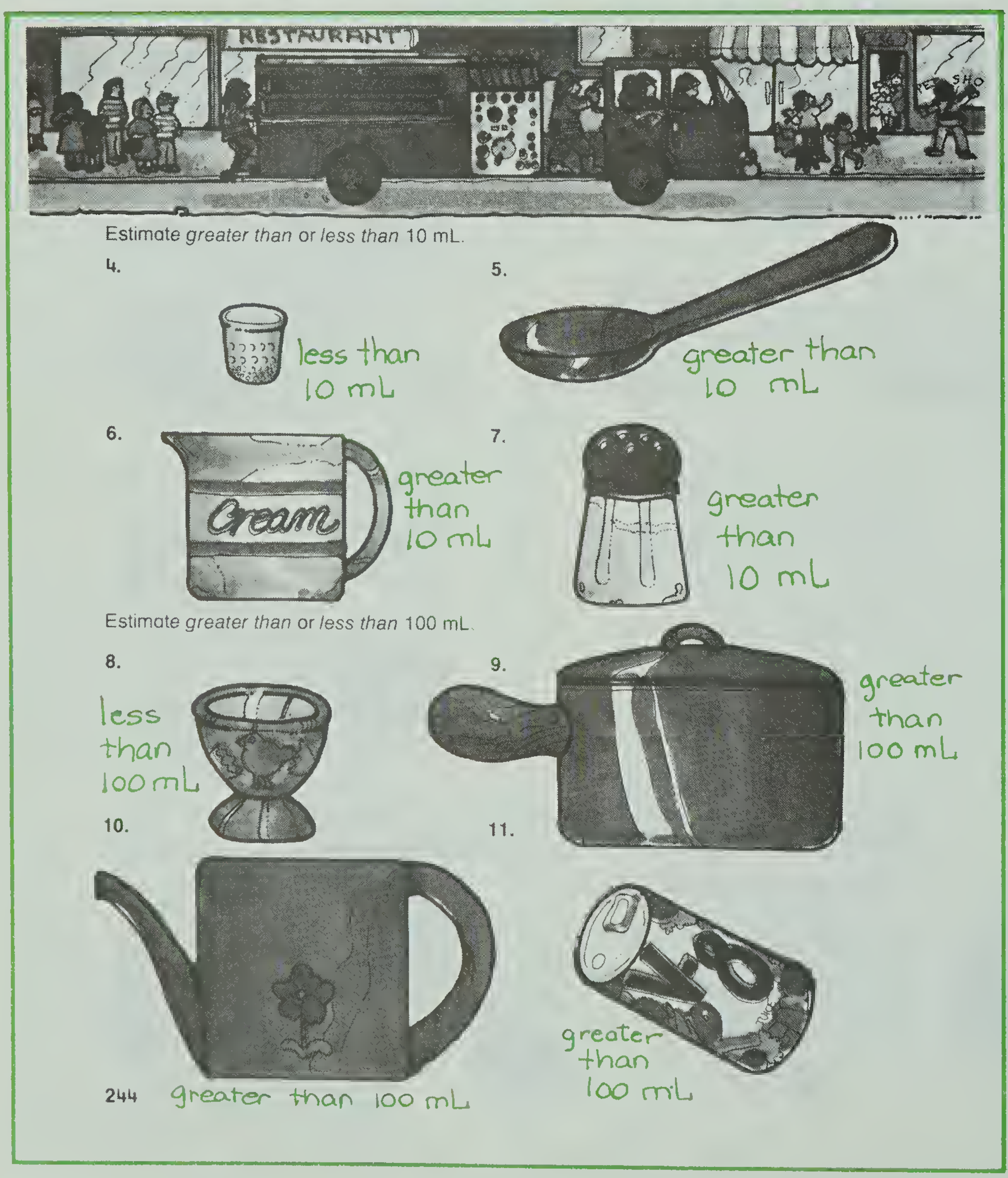
4
Hold up the 1 mL measuring spoon. Name the unit and write the word and symbol on the easel. Then, pointing to the 10 mL container, ask
How many of these spoonsful of water do you think it will take to fill this container, Joanna?
Have each child in the group estimate, then appoint a child to measure.

5
Have pairs of children arrange five unmarked containers in order from least to greatest capacity. The children check their estimates by filling the largest container with water and pouring the contents into the other containers. If any water remains, the estimate was correct and the children repeat the procedure, using the next largest container, and so on. If some children wish to use another method to check their estimates, encourage them to do so, and have them describe the method's effectiveness to the group.

Written and Other Activities

☐

mathways 3, pages 243, 244
Have different children read each of the instructions aloud and discuss them. Allow the children to work independently or in pairs to complete the investigation and the In Action activity. Have the children explain the reasons for their estimates.



Estimate *greater than* or *less than* 10 mL.

4. less than 10 mL

5. greater than 10 mL

6. greater than 10 mL

7. greater than 10 mL

Estimate *greater than* or *less than* 100 mL.

8. less than 100 mL

9. greater than 100 mL

10. greater than 100 mL

11. greater than 100 mL

244

☐ ☐

Letter containers *A, B, C* and so on to identify them, and prepare activity cards such as the following:
1. Write the letter for a container that you think has a capacity greater than 10 mL. *Then measure to check. Is the container's capacity greater than 10* mL*?*

Prepare cards like this one for 100 mL, and 1 L. For each capacity, prepare two cards; one for estimating capacities *greater than,* and one for estimating capacities *less than.*
2. Write the letter of each container that you think has a capacity of about 10 mL. *Measure to check. Was your guess correct?*
Prepare a card of this kind for each of the standard units.
3. Fill a 10 mL *container with water or sand and pour the contents into a 100* mL *container. Repeat until the 100* mL *container is full. How many times did you do this before the 100* mL *container was full to the top?*
Repeat the instructions, substituting 100 mL and 500 mL; 100 mL and 1 L; and 500 mL and 1 L.
4. Fill a 100 mL *container with water. Pour water from the container into a 10* mL *container. Empty the 10* mL *container. Continue until the 100* mL *container is empty. How many times did you fill the 10* mL *container?*
Provide a card of this kind for 500 mL and 100 mL; 1 L and 100 mL; and 1 L and 500 mL.

☐ ☐ ☐

Have each child prepare an activity card for the measuring centre. Have the children exchange cards and follow the instructions. Discuss the activities and the results.

Unit 3 Section 9 Lesson 3

Estimating and Measuring Capacity: 100 mL

Materials

- 100 mL container, marked
- set of measuring spoons marked in millilitres
- containers of various capacities

Lesson

1

Gather the children around the measurement centre. Display a container. Ask a few children to estimate its capacity in millilitres. Record the estimates.
Have a child find the capacity of the container. Compare this with the estimates, emphasizing that any close estimate is a very good estimate.
Repeat this a few times for other containers. Involve the children in measuring to check their estimates. Include some containers with a capacity of less than 100 mL, so that the measuring begins with the measuring spoons.

2

Have the children complete the following chart for five containers at the measuring centre, using millilitres as the unit of measurement:

Container	Estimate	Measurement

3

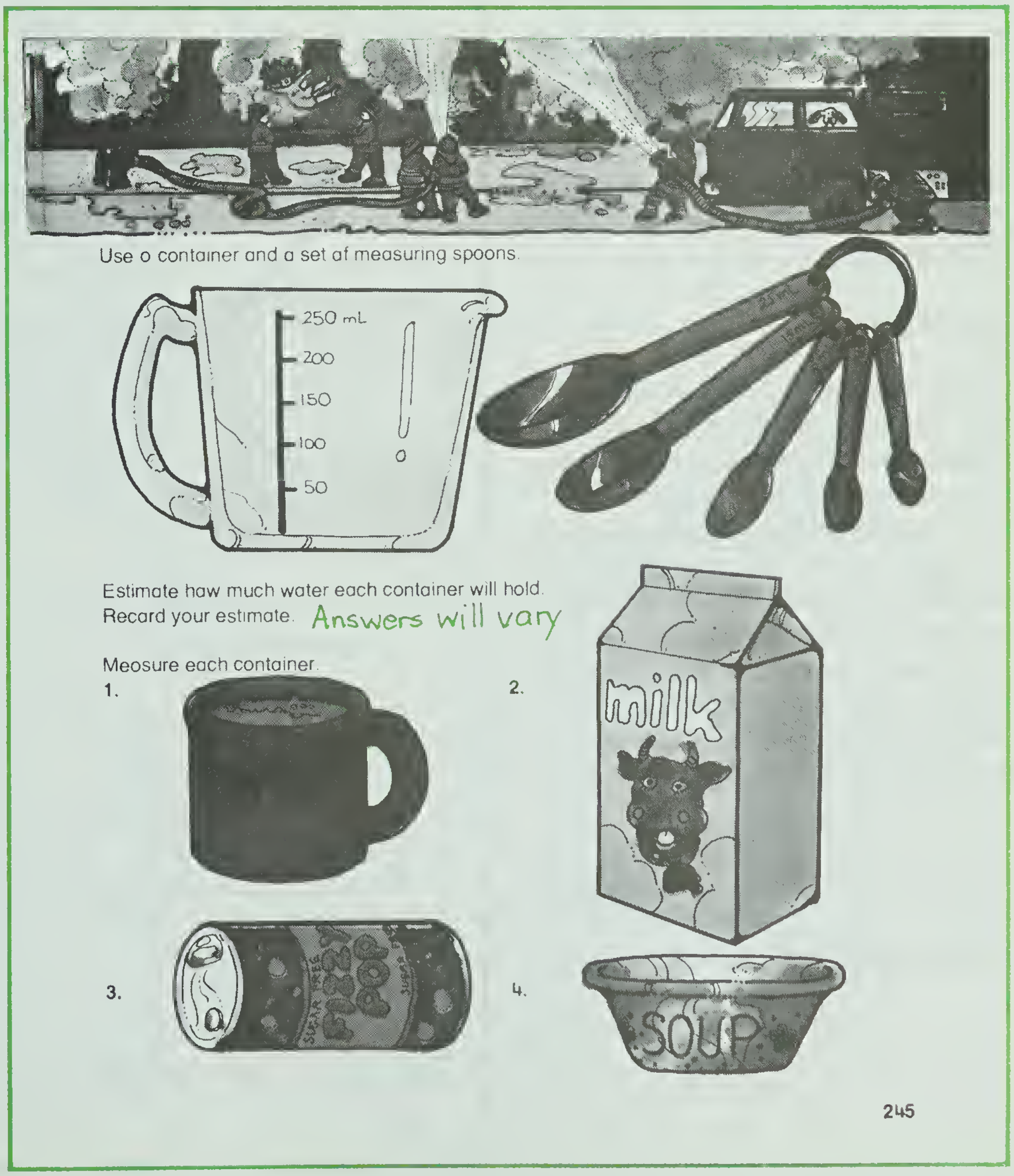
To review litres, have the children complete the same chart for larger containers, using litres as the reference unit. Encourage the children to bring from home containers marked in millilitres. Display these at the measuring centre.

Written and Other Activities

☐

mathways 3, page 245

Remind the children that the estimate must be recorded before starting to measure.



Use a container and a set of measuring spoons.

Estimate how much water each container will hold.
Record your estimate. Answers will vary

Measure each container.

1.

2.

3.

4.

245

Unit 3 Section 10 Lesson 1

PROBLEM SOLVING

Exploring the Tangram

Materials

- demonstration-size tangram
- for each child
  - ruler and tracing paper, or copy of Program Master 29
  - light cardboard
  - pair of scissors
  - envelope

Rationale

Manipulating tangram pieces helps children develop creativity in solving puzzles and an intuitive understanding of the properties of geometric regions. Tangrams can be purchased from school supply companies, but the children often enjoy making their own. Program Master 29 can be used for this purpose. Child-made tangrams can be stored in envelopes and used for all the activities suggested here or in the *mathways* 3 text. Some children may wish to make an extra tangram to take home; if so encourage them to explore with a view to making up activities that can be shared with other children.

Lesson

1

Gather the children around the working area and show them the demonstration tangram assembled as a square. The children may be interested in hearing that the puzzle is the subject of an ancient Chinese legend in which a man is said to have dropped a square tile. The tile broke into seven pieces and, in trying to put it together again, the man discovered this fascinating puzzle, which has been used in both China and Greece for over 2000 years.

2

You are going to make a puzzle like this.
First, let's look at the puzzle pieces.

Ask a child to count the pieces, and ask different children to name the shape of each piece. There are two large triangles, one medium-size triangle, two small triangles, one square and one parallelogram.

Written and Other Activities

☐

mathways 3, pages 246, 247

Distribute the necessary materials for making tangrams. As the children work, circulate among them to help solve any difficulties they may be experiencing in tracing, cutting out or fitting the pieces as directed on the text pages.

☐ ☐

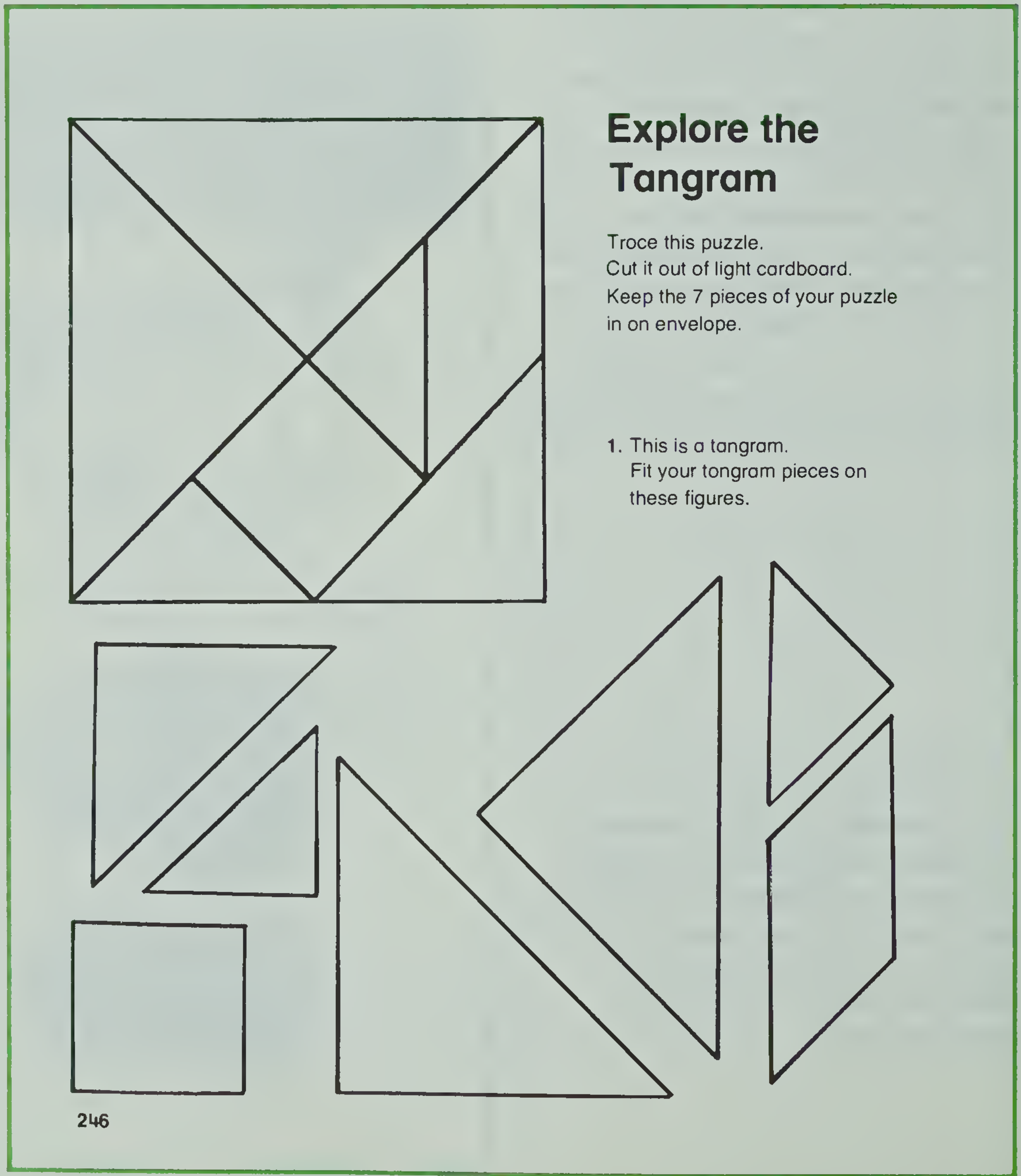
Allow the children to experiment freely with their tangram pieces and share their discoveries.

☐ ☐ ☐

If interest in tangram puzzles is high, have the children create others to take home.

☐ ☐ ☐ ☐

Some children may wish to make tangram puzzles for the activity centre. Encourage them to number the pieces for each tangram and place the puzzle in an envelope or small box so that others can enjoy it. Extend the activity by inviting the children to fit pieces together in unusual ways and outline the regions created on paper. Have the



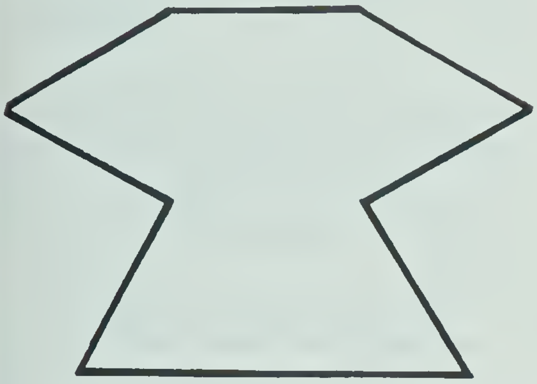
Explore the Tangram

Trace this puzzle.
Cut it out of light cardboard.
Keep the 7 pieces of your puzzle in an envelope.

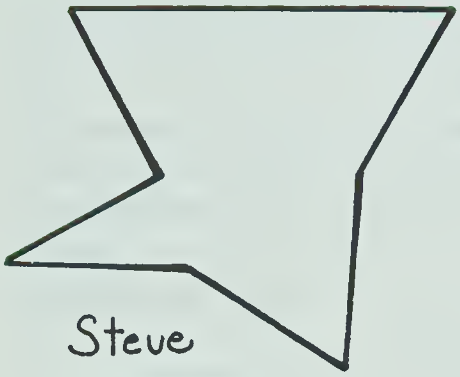
1. This is a tangram.
   Fit your tangram pieces on these figures.

246

children write their names on the papers and label them with the number of pieces used to create the figures. For example

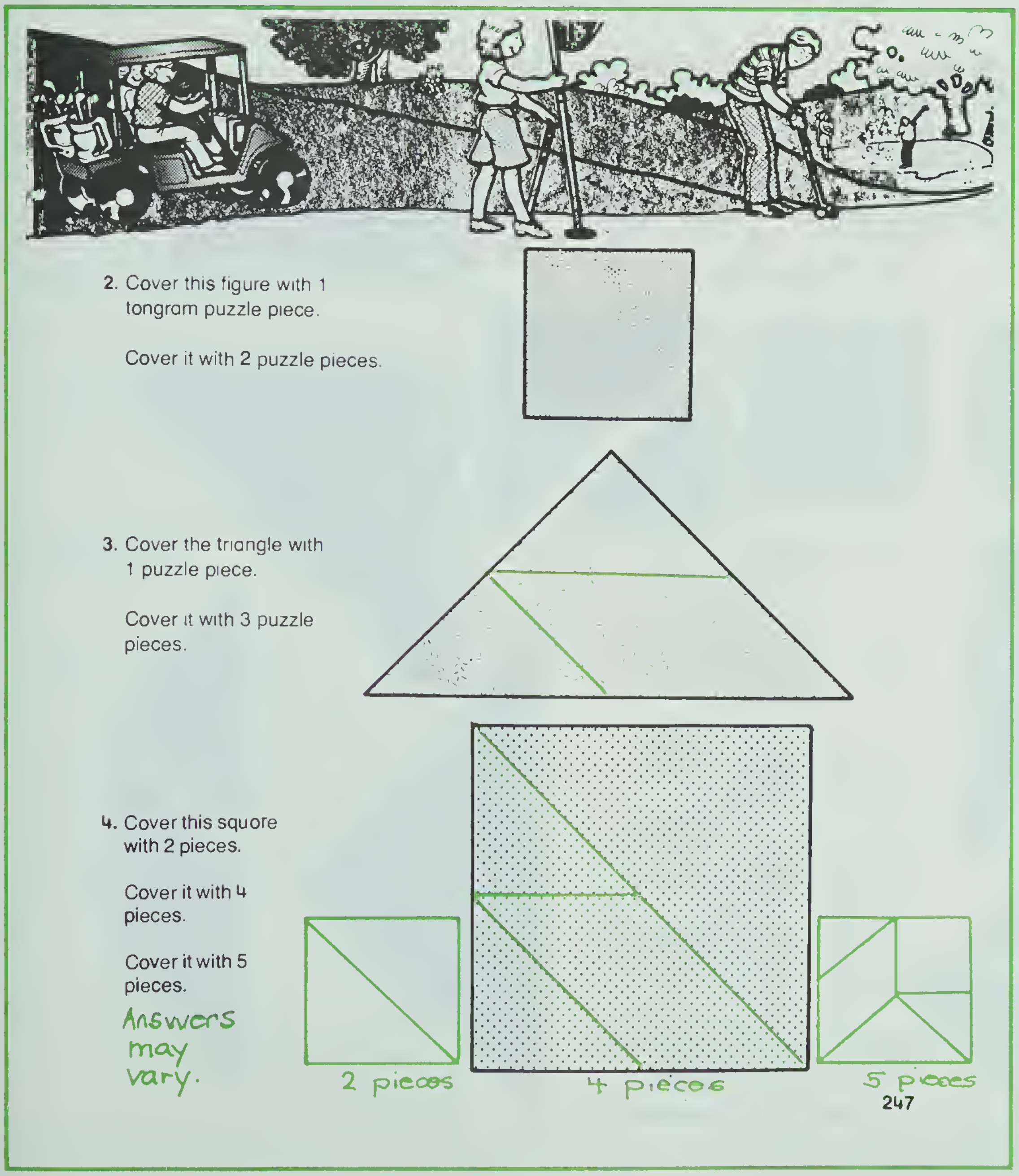


Susan
4 pieces



Steve
3 pieces

The children then mount the drawings and place them in the activity centre, along with the tangram puzzles. In their spare time, the children select puzzles and try to fit the pieces into the outlines to discover how each figure was made.



2. Cover this figure with 1 tangram puzzle piece.

Cover it with 2 puzzle pieces.

3. Cover the triangle with 1 puzzle piece.

Cover it with 3 puzzle pieces.

4. Cover this square with 2 pieces.

Cover it with 4 pieces.

Cover it with 5 pieces.

Answers may vary.

2 pieces

4 pieces

5 pieces

247

For Your Notes

Unit 3 Section 10 Lesson 2

PROBLEM SOLVING

Exploring Tangrams: Making Rectangles

Materials

- for each child
  - numbered tangram pieces: Program Master 29
- demonstration-size tangram

Lesson

1

Gather the children into the working area. Make sure each child has a tangram puzzle. Draw a rectangle on the easel.

Who can tell me what this figure is called?

Is there anything special about rectangles? How would you describe a rectangle, Amy?

Place the large tangram in the centre of the area.

Joe, which of these pieces would you fit together to make a rectangle? Will you show us, please?

Invite other children to use their tangram pieces to construct rectangles. Manage the activity to show that different rectangles can be made. Discuss the activity, comparing likenesses and differences between the rectangles created by the children.

Written and Other Activities

☐

mathways 3, page 248

As the children work to carry out the instructions, circulate among them to help solve any problems that may arise, and to offer encouragement. Make sure that the children write the numbers of the puzzle pieces used for each rectangle they trace into their notebooks.

☐ ☐

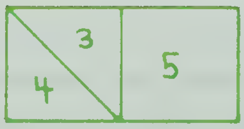
Have the children use their tangram pieces to outline as many rectangles as they can on sheets of paper. Tell them not to label the drawings with the numbers of the pieces used to create the rectangles. Have them place the outlines in the activity centre, where other children can cover them with tangram pieces to discover which pieces were used in each case and label them accordingly.

☐ ☐ ☐

Encourage the children to outline on paper unusual configurations of tangram pieces for the activity centre, where others can attempt to identify the pieces used in each case and write the numbers.

Additional Answers

1.



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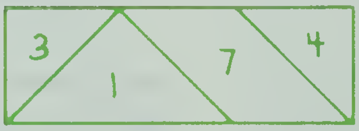

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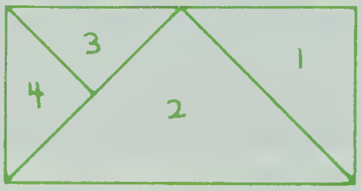

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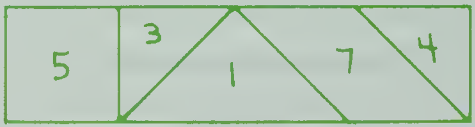

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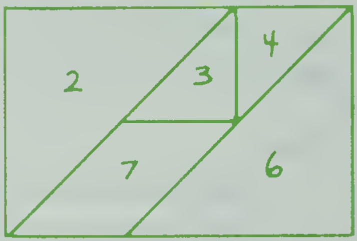

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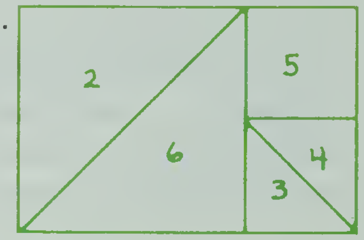
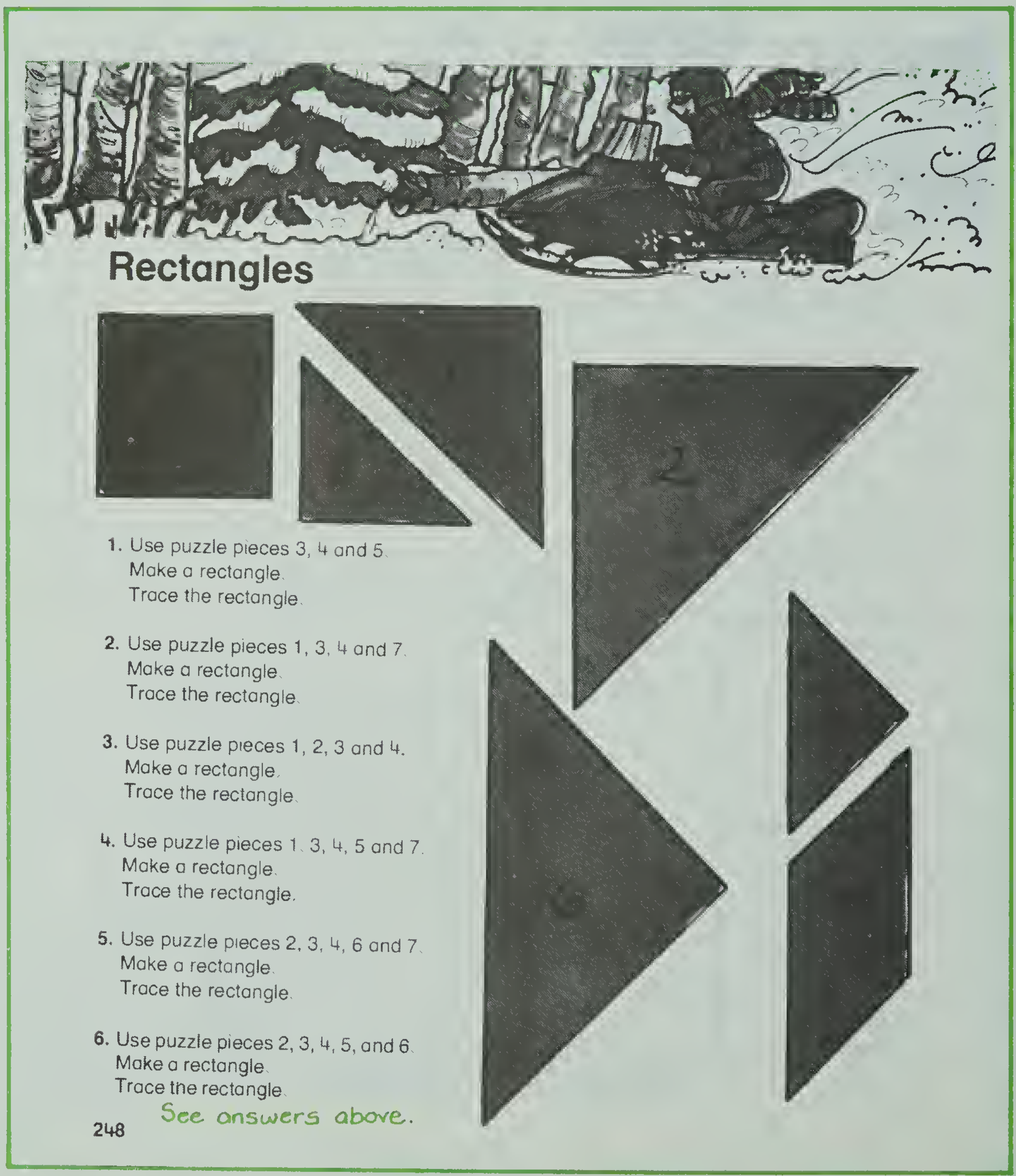




Rectangles

1. Use puzzle pieces 3, 4 and 5.
   Make a rectangle.
   Trace the rectangle.
2. Use puzzle pieces 1, 3, 4 and 7.
   Make a rectangle.
   Trace the rectangle.
3. Use puzzle pieces 1, 2, 3 and 4.
   Make a rectangle.
   Trace the rectangle.
4. Use puzzle pieces 1, 3, 4, 5 and 7.
   Make a rectangle.
   Trace the rectangle.
5. Use puzzle pieces 2, 3, 4, 6 and 7.
   Make a rectangle.
   Trace the rectangle.
6. Use puzzle pieces 2, 3, 4, 5, and 6.
   Make a rectangle.
   Trace the rectangle.

248 See answers above.

Unit 3 Section 10 Lesson 3

Exploring Tangrams: Making Squares and Triangles

Materials

- demonstration-size tangram
- for each child
  - numbered tangram pieces

Lesson

1

Have the children bring their tangram puzzles to the working area. Draw a square on the easel.

Can you tell me the name of this figure, Bernard?

Is there anything special about a square? How would you describe a square, Shelleen?

In what way is the square the same as a rectangle? In what way is it different?

Ask the children to use their tangram pieces to make squares. Manage the activity to show that squares of different sizes can be made.

2

Draw a triangle on the easel and invite children to discuss its properties, drawing on memory and observation of the figure on the easel and triangular tangram pieces in the centre of the working area. Ask the children to use their tangram pieces to make triangles. Manage the activity to show that several different triangular figures can be made.

Written and Other Activities

☐

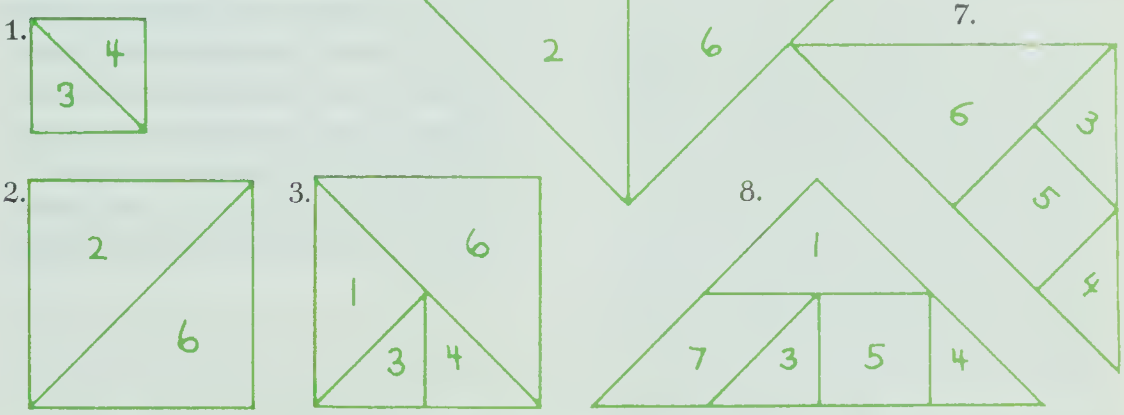
mathways 3, page 249

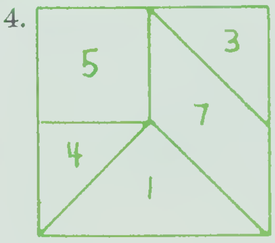
As the children work to carry out the instructions on the page, circulate among them to clear up any misunderstandings or difficulties, and to offer encouragement. Have the children trace the figures into their notebooks and label each with the pieces used.

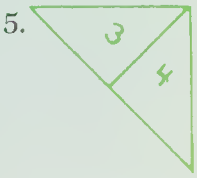
☐ ☐

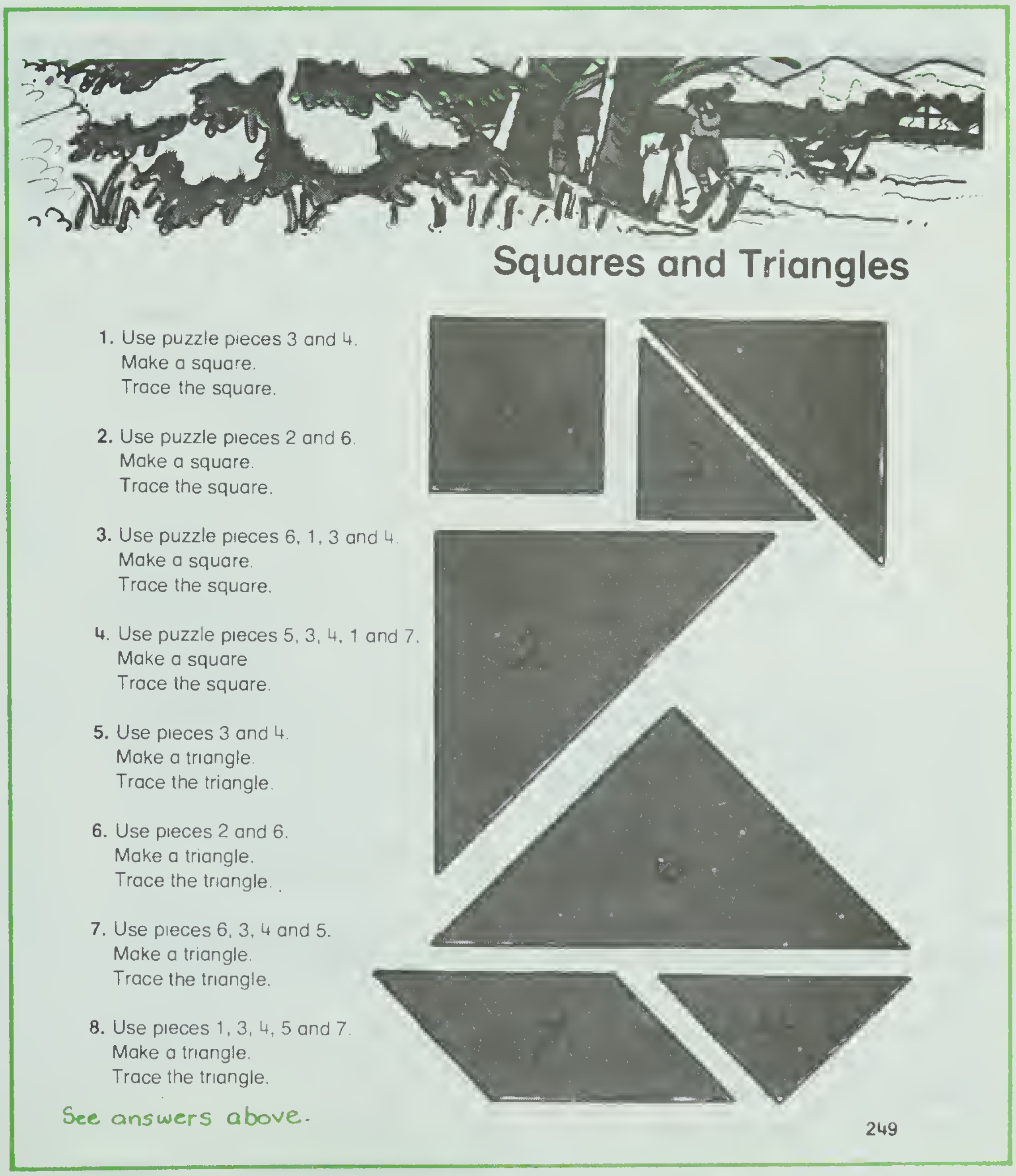
Have the children use tangram pieces to build rectangles, squares and triangles and trace them onto sheets of paper for the activity centre. Tell the children to write their names on the papers but not the numbers of the tangram pieces used to create the figures. Each child selects a figure drawn by another and covers it with tangram pieces to discover which pieces were used, then labels the figure with the numbers of the tangram pieces.

Additional Answers









Squares and Triangles

1. Use puzzle pieces 3 and 4.
Make a square.
Trace the square.

2. Use puzzle pieces 2 and 6.
Make a square.
Trace the square.

3. Use puzzle pieces 6, 1, 3 and 4.
Make a square.
Trace the square.

4. Use puzzle pieces 5, 3, 4, 1 and 7.
Make a square
Trace the square.

5. Use pieces 3 and 4.
Make a triangle.
Trace the triangle.

6. Use pieces 2 and 6.
Make a triangle.
Trace the triangle.

7. Use pieces 6, 3, 4 and 5.
Make a triangle.
Trace the triangle.

8. Use pieces 1, 3, 4, 5 and 7.
Make a triangle.
Trace the triangle.

See answers above.

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Unit 3 Section 10 Lesson 4

Byway: Solving Tangram Puzzles

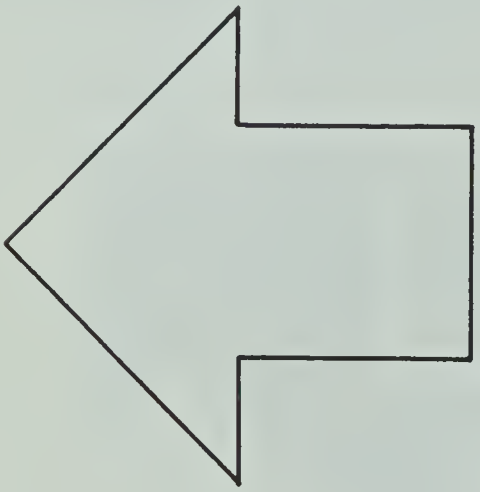
Materials

- book of tangram puzzles
- for each child
  - tangram puzzle pieces
  - blank card
  - Program Master 29

Lesson

1

Gather the children into the working area. Tell them to bring their tangram puzzles and give each child a sheet of paper. Have the children arrange tangram pieces on the paper in unusual configurations and trace the outline of the resulting figures. Have the children exchange papers and then experiment, covering the figures with tangram pieces to discover how the figures were made. As the children work, circulate among them to offer encouragement and make suggestions when needed.



2

Show the children the book of tangram puzzles, commonly available from book stores and school supply houses. Suggest to the children that the group make a book of tangram puzzles. Give each child a blank sheet of paper on which to trace interesting figures made with their tangram puzzles. Gather the children's work together and staple it into booklet form, providing a cover page on which to write a title suggested by the group. Place the booklet in the activity centre.

Written and Other Activities

☐

mathways 3, page 250

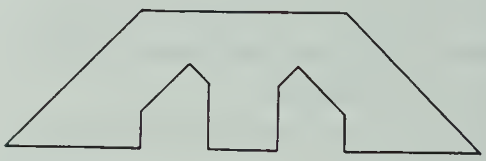
Discuss the figures in the illustration, asking children what real life object each figure resembles.

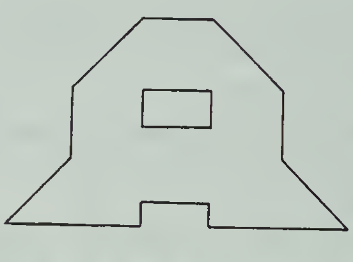
☐ ☐

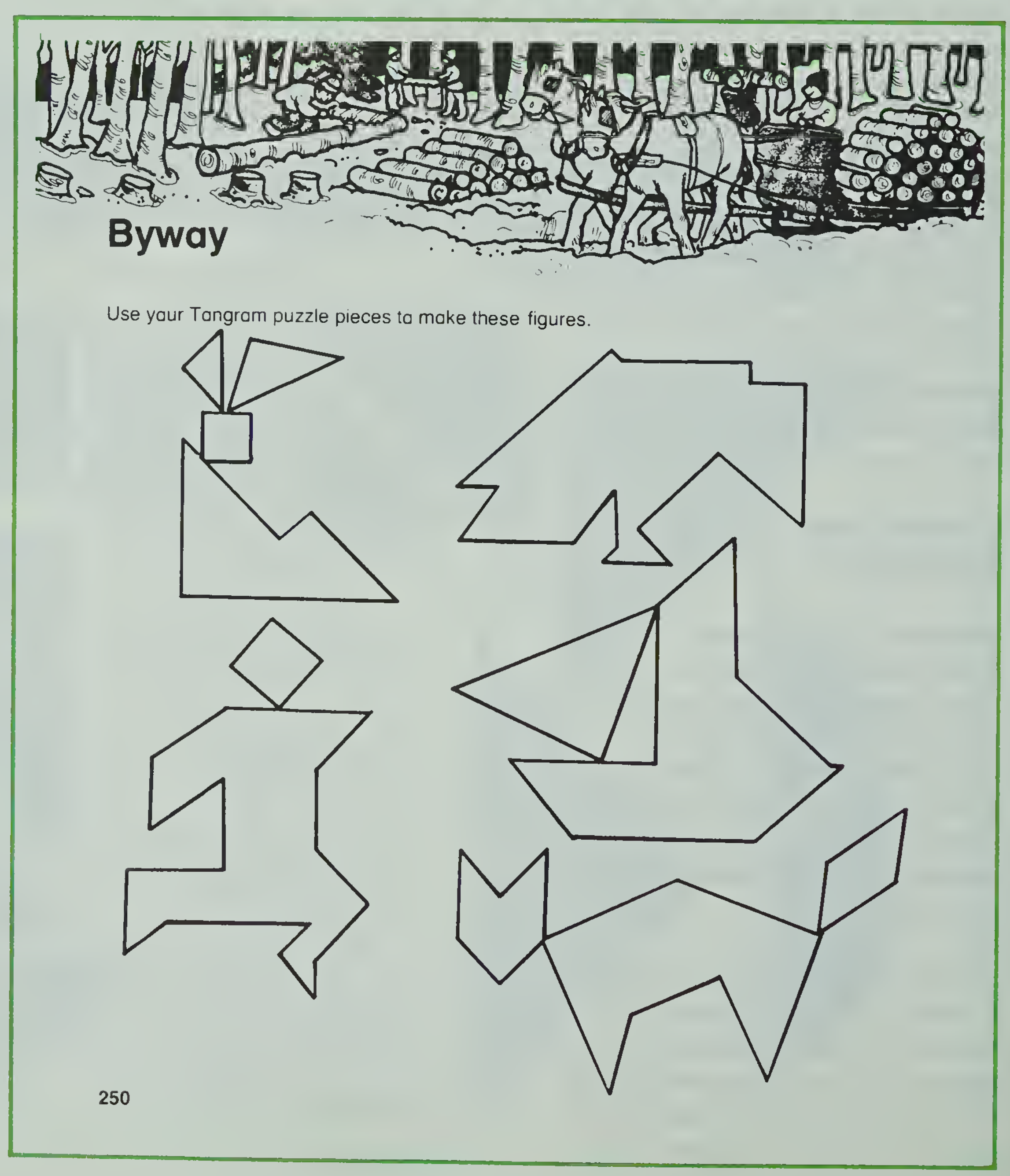
Have the children work in pairs at the activity centre to solve some of the tangram puzzles created by the other children. Have them write the names of things that each puzzle reminds them of. Discuss the activity so that the children can share their observations.

☐ ☐ ☐

The tangram puzzles which surround the tangram on Program Master 29 provide an interesting challenge for tangram enthusiasts. Additional puzzles are shown here.







Byway

Use your Tangram puzzle pieces to make these figures.

250

Unit 3 Section 11 Lesson 1

Exploring Volume: Building with Cubes

Materials

- for each child
  - – 2 cm interlocking cubes
  - – sheet of 2 cm graph paper, reproduced from Program Master 6

Rationale

In *mathways* 3, the concept of volume and the skills needed to find the volume of a structure in cubic units begins with building forms with cubes, then counting the cubes, including those that may be hidden under or behind other cubes. If the children have had little experience with cubes, they would benefit from an opportunity to play with them before being asked to participate in more structured activities.

Lesson

1

Gather the children into the working area and place the interlocking cubes in the centre, making sure that there are enough so that each child can experiment freely. Encourage the children to build any form that occurs to them. Allow time for discussion so that the children can enjoy each other's creations and comment upon them.

2

Tell each child in the group to build a particular form with cubes. For example one child might build an apartment building, another might build an animal, another a vehicle, and so on. When the children have finished, have each child count the number of cubes used to make the assigned form. Discuss the activity, emphasizing that while for some forms all the cubes can be seen at a glance, for others some of the cubes are hidden behind or under other cubes. Use the forms the children have built to illustrate.

3

Have each child count out 12 cubes. Instruct the children to use the cubes to build structures of their own choosing. When they have finished, discuss the forms, comparing their likenesses and differences. Repeat the procedure, asking the children to use 10 cubes, then 15 cubes, and so on.

Written and Other Activities

☐

mathways 3, page 251

Have a child read the first instruction aloud. Have other children rephrase the instruction in their own words. Have the children work independently to complete the page. When they have finished, encourage them to count the cubes in each other's boats and trucks.

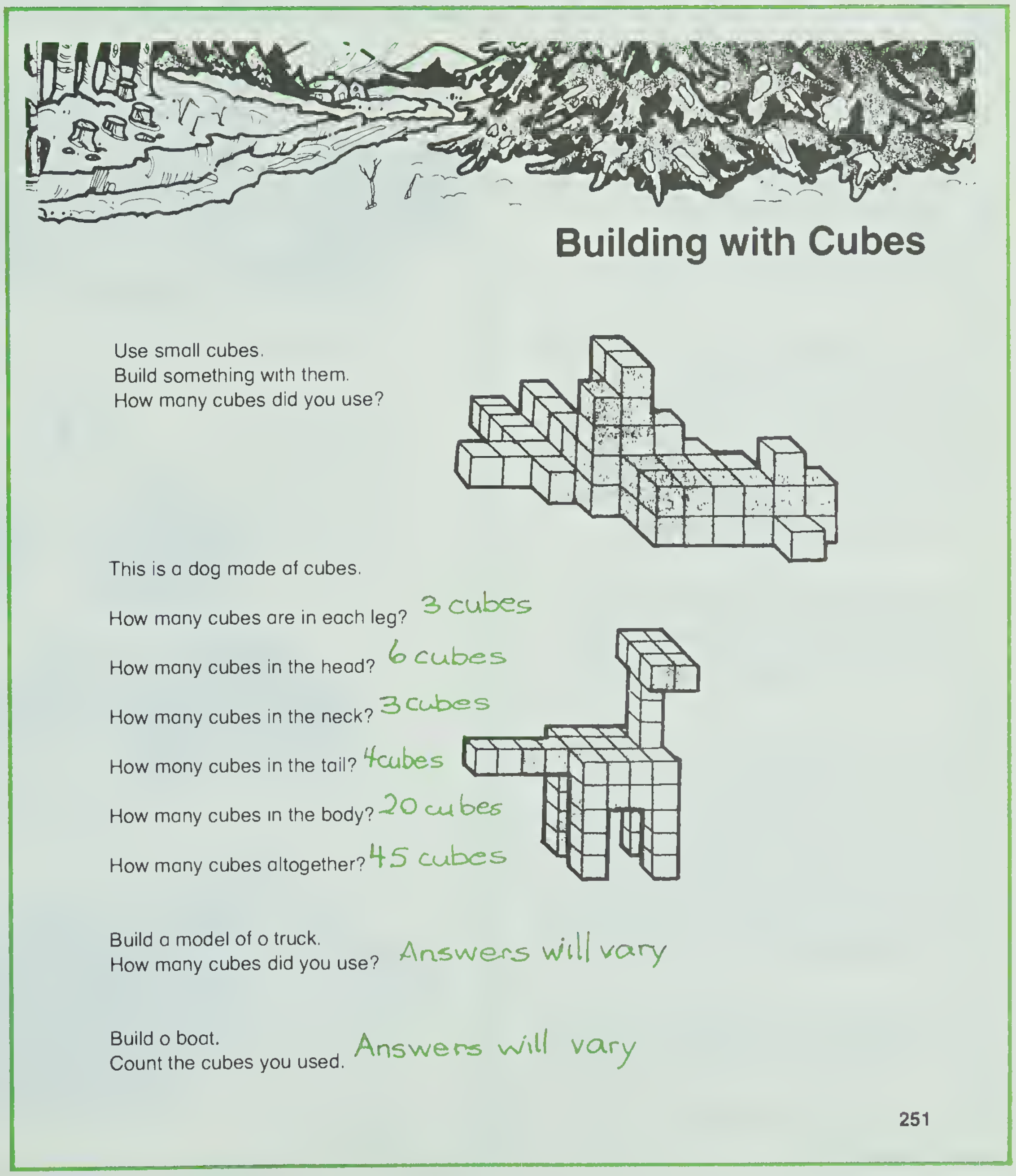
☐ ☐

Have the children work in pairs to create other structures. Comment upon the form created by each pair of children, then ask how many cubes were needed to make it. When the children have counted the cubes in their own structures, have them count the cubes in those created by the other children.

☐ ☐ ☐

Distribute 2 cm graph paper, giving one sheet to each child. Show the children how a pattern of squares can be folded to form a cube.

Then give each child a 2 cm cube. Have the children experiment to find a different pattern that, when folded, results in a cube. Tell the children that an easy way to check a pattern is to fold it around the cube that has been provided. Have the children count the squares in their patterns.



Building with Cubes

Use small cubes.
Build something with them.
How many cubes did you use?

This is a dog made of cubes.

How many cubes are in each leg? 3 cubes

How many cubes in the head? 6 cubes

How many cubes in the neck? 3 cubes

How many cubes in the tail? 4cubes

How many cubes in the body? 20 cubes

How many cubes altogether? 45 cubes

Build a model of a truck.
How many cubes did you use? Answers will vary

Build a boat.
Count the cubes you used. Answers will vary

251

Unit 3 Section 11 Lesson 2

Exploring Volume: Counting Cubic Centimetres

Materials

- 1 cm interlocking cubes
- tape
- sheet of 1 cm graph paper
- for each child
  - centimetre ruler
  - 1 cm graph paper reproduced from Program Master 5
- for each group of six children
  - marking pen

Lesson

1

Gather the children around the working area and give each child a 1 cm cube and a ruler. Have them measure the length of each side of the cube.

How long are the sides of your cube, Fabian?

Does anyone have a cube whose sides are not 1 cm long?

Explain that since a cube is 1 cm by 1 cm by 1 cm, describing the length of each of its sides and its height, we call the measurement one cubic centimetre. Write on the easel

one cubic centimetre $1\ \text{cm}^3$

Ask

What kinds of things can be measured in cubic centimetres, Paul?

What other things can you think of?

The children may think of the interior of a box or the cubic structures built for the previous day's lesson.

2

Ask the children to close their eyes. Put together six interlocking cubes, then ask the children to open their eyes.

How many cubic centimetres do you think this is, Donald?

Do you agree, Marianne?

Have each child in the group estimate the number of cubes. Then have a child count the cubes in the structure to check. Record on the easel

$6\ \text{cm}^3$

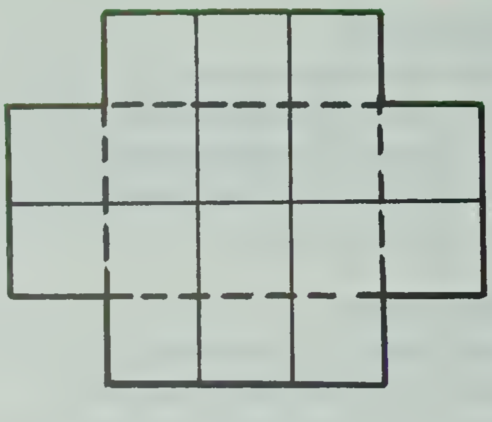
Explain that a measurement given in cubic centimetres is called the volume. Say

The volume of this structure is six cubic centimetres.

Repeat the procedure, using other numbers of cubes to build other forms. As the children become familiar with the symbol, invite individuals to record the volume of the forms on the easel.

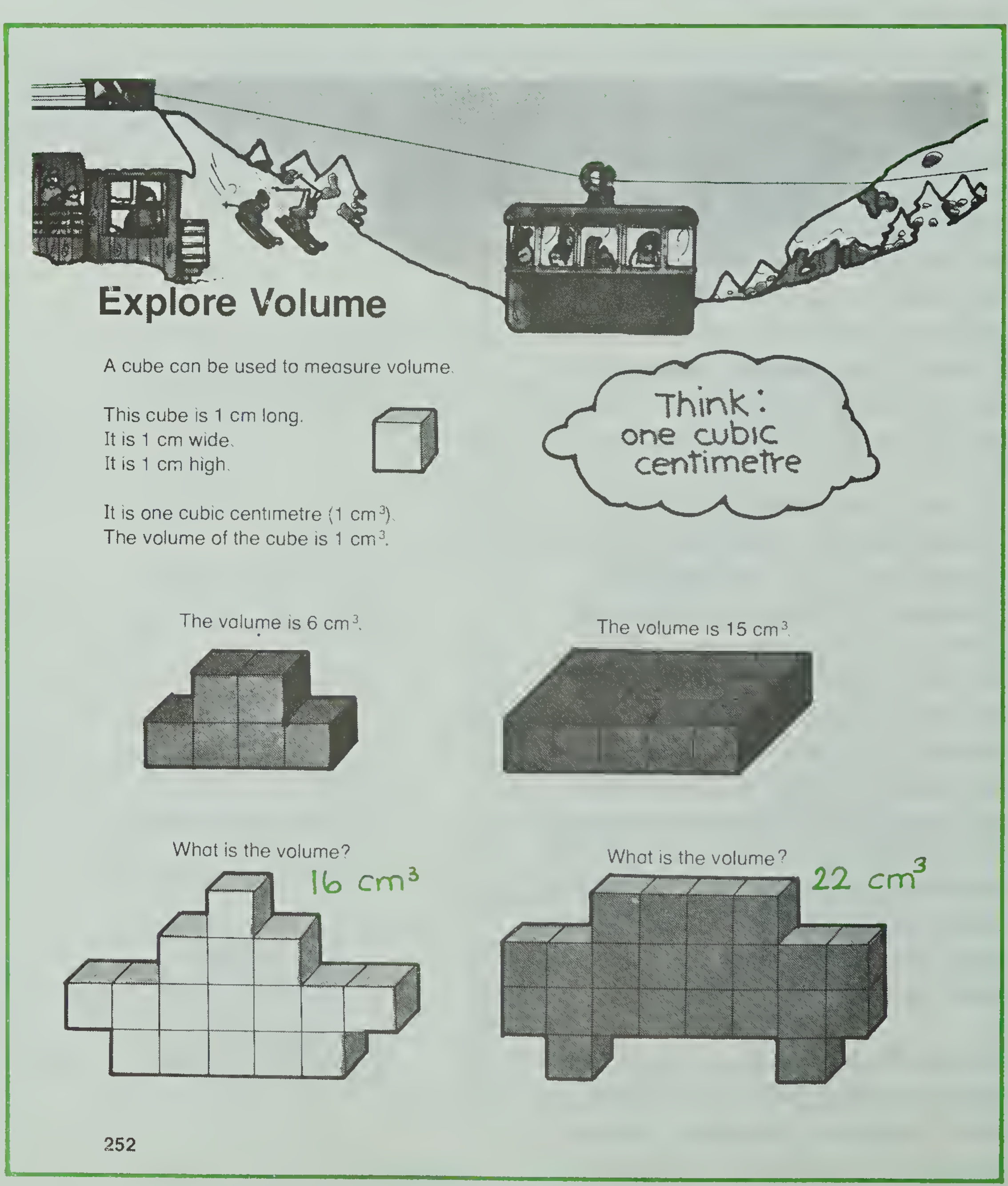
3

Give each child a sheet of 1 cm graph paper. Demonstrate how patterns can be cut from the paper to construct boxes. Cut the following pattern to make a 3 cm by 2 cm by 1 cm box, as shown on the right.



Fold the pattern and tape the edges together. Have the children help make boxes of different sizes, including boxes with heights of 2 cm and 3 cm.

Show one of the boxes and ask each child to estimate its volume in cubic centimetres. Have a child fill the box with 1 cm cubes and record the volume on the easel. Repeat, asking the children to estimate, measure and record the volume for several other boxes.



Explore Volume

A cube can be used to measure volume.

This cube is 1 cm long.
It is 1 cm wide.
It is 1 cm high.

Think: one cubic centimetre

It is one cubic centimetre ($1\ \text{cm}^3$).
The volume of the cube is $1\ \text{cm}^3$.

The volume is $6\ \text{cm}^3$.

The volume is $15\ \text{cm}^3$.

What is the volume? 16 cm^3

What is the volume? 22 cm^3

252

Written and Other Activities

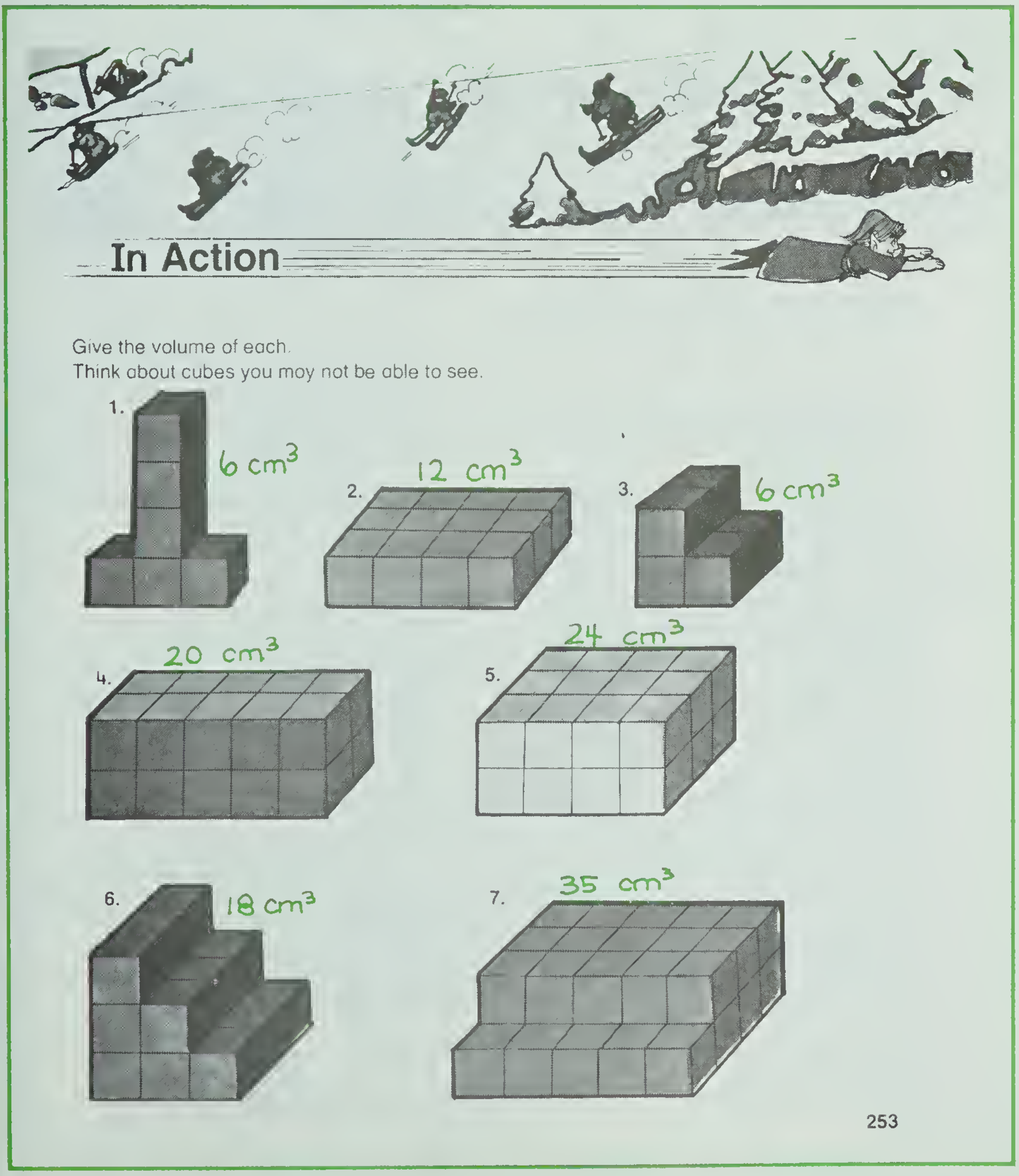
☐

mathways 3, pages 252, 253

Have children read page 252 aloud. Compare the picture of the cube with the cubes used during the lesson. Discuss each of the structures pictured, and have the children count the cubes to verify or discover the volume for each. Remind the children that it is not always possible to see all the cubes used to make a structure. This difficulty often occurs when we are looking at a picture of a structure, as well. Assign the In Action activity on page 253.

☐ ☐

Have the children use 1 cm cubes to make three different structures having each of the following volumes: 10 cm^3, 15 cm^3 and 20 cm^3. Each child builds a total of nine structures.



In Action

Give the volume of each.
Think about cubes you may not be able to see.

1. 6 cm^3
2. 12 cm^3
3. 6 cm^3
4. 20 cm^3
5. 24 cm^3
6. 18 cm^3
7. 35 cm^3

253

For Your Notes

Unit 3 Section 11 Lesson 3

Exploring Volume

Materials

- 1 cm interlocking cubes
- for each child
  - small box, brought from home
  - sheet of 1 cm graph paper reproduced from Program Master 5
  - piece of construction paper
  - pair of scissors
  - glue

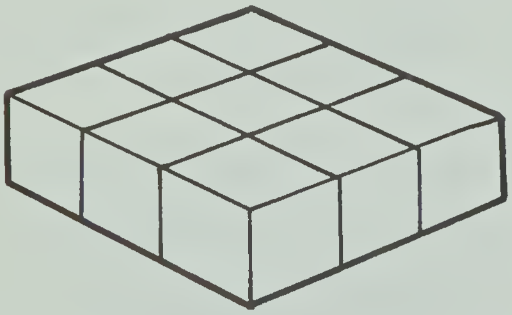
Rationale

In later grades, children are often asked to find the volume of a rectangular prism by multiplying the number of cubes needed to cover the base by the number of layers needed to fill it. This section of *mathways 3*, and in particular, this lesson, is designed to give the children the background of experience they will need to comprehend the formula and use it effectively to find the volume of various rectangular prisms when they are called upon to do so.

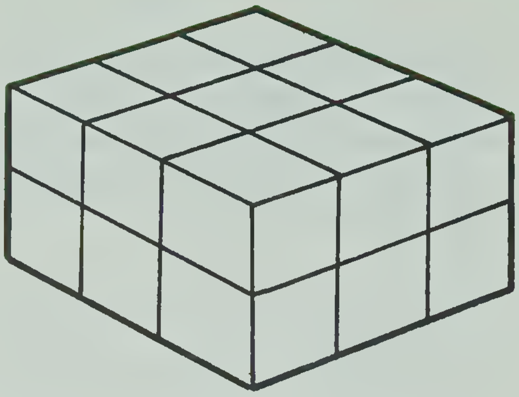
Lesson

1

Lay out a one-layer pattern of cubes in an interesting configuration. Have each child build the same configuration. Have a child count the number of cubes and record the volume on the easel; for example *9* cm^3.



Invite the children to each add a layer of cubes on their first layers.



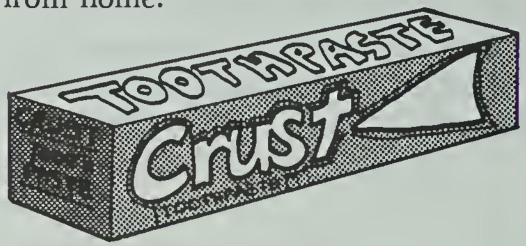
Have the children count the total number of cubes and ask one to record the volume on the easel.

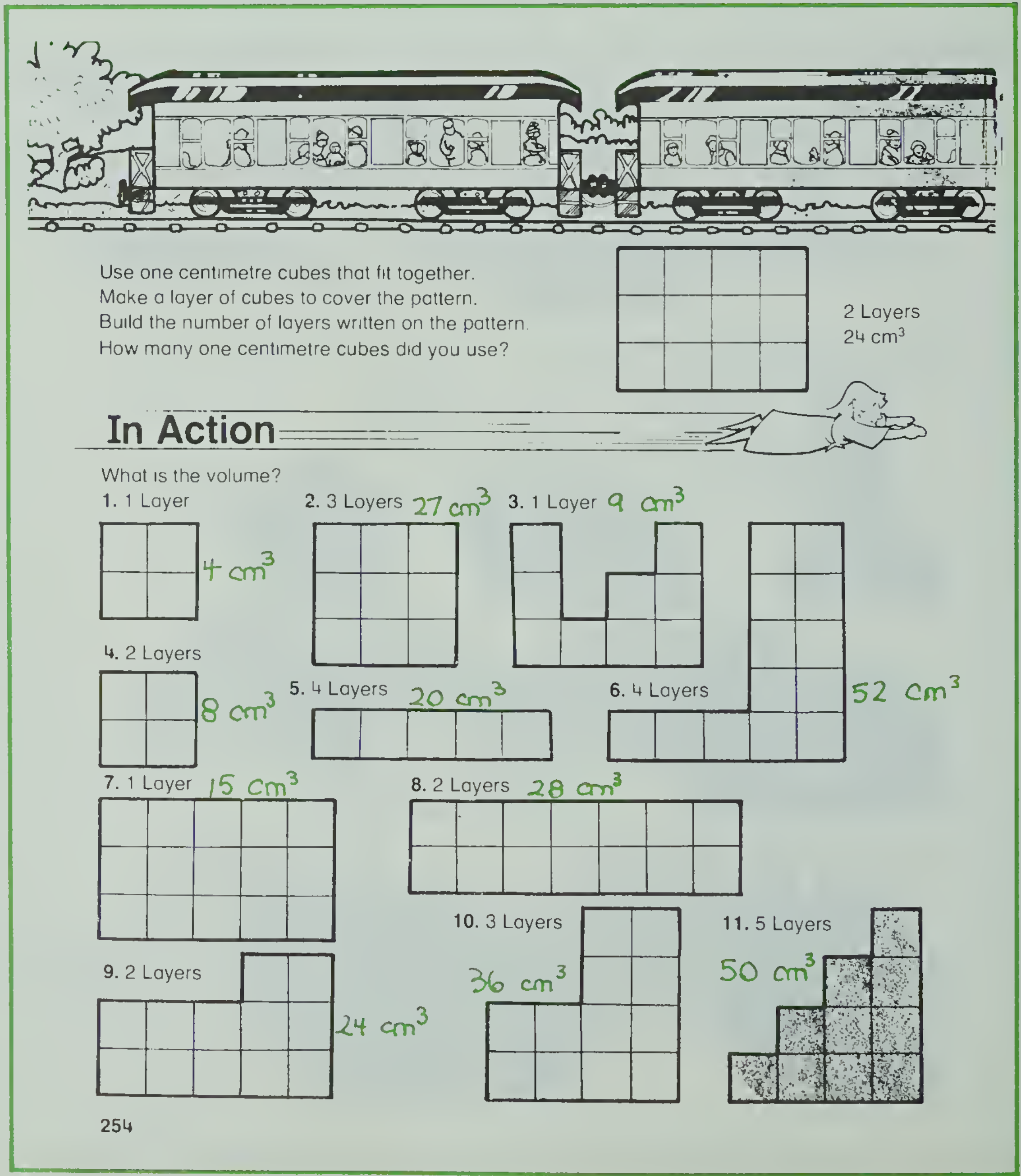
2

Have each child in the group lay out a one-layer pattern of seven cubes on the floor of the working area. Encourage the children to create unusual patterns. Discuss each of the resulting patterns, and ask each child to state the volume in cubic centimetres. Have the children add layers to the patterns and state the volume after the addition of each layer. Ask each child in the group to suggest real-world forms that are similar to the structures. Do changes in appearance affect the volume? Display the forms at the activity centre for the class to enjoy.

4

Have each child record an estimate of the volume of a small box brought from home.





Use one centimetre cubes that fit together.
Make a layer of cubes to cover the pattern.
Build the number of layers written on the pattern.
How many one centimetre cubes did you use?

2 Layers
24 cm^3

In Action

What is the volume?

1. 1 Layer 4 cm^3
2. 3 Layers 27 cm^3
3. 1 Layer 9 cm^3
4. 2 Layers 8 cm^3
5. 4 Layers 20 cm^3
6. 4 Layers 52 cm^3
7. 1 Layer 15 cm^3
8. 2 Layers 28 cm^3
9. 2 Layers 24 cm^3
10. 3 Layers 36 cm^3
11. 5 Layers 50 cm^3

254

Then have the child fill the box with cubes as nearly as possible and record the volume to the nearest cubic centimetre. Have the children trade boxes and repeat the procedure, giving each child an opportunity to estimate and measure the volume of several boxes. Discuss the activity. Were there any surprises? Was the volume of a box that appeared to be smaller than another actually greater than the volume of the seemingly larger box? How many layers of cubes did it take to fill the respective boxes?

Put the boxes in the activity centre.

Written and Other Activities

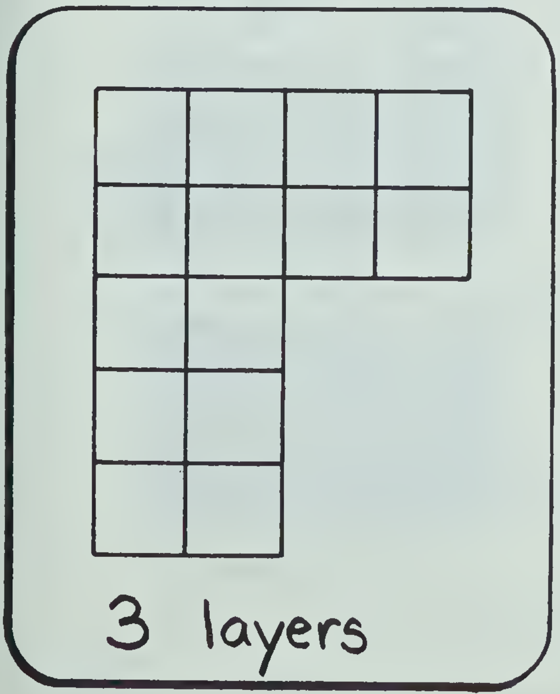
☐

mathways 3, page 254

Have a child read the instruction at the top of the page. Have several children explain what they will do to complete the In Action activities. Provide cubes in sufficient quantities so that the children will not disturb each other while they are working. Have them record the volume of each form in their notebooks.

☐ ☐

Distribute sheets of 1 cm graph paper. Have the children cut patterns of squares to create regions of various sizes. Give each child a piece of construction paper on which to glue the regions. Instruct the children to cut these regions out, leaving a border of construction paper at the bottom on which to record a number of layers to be built. Have the children exchange the resulting activity cards and build the indicated structures. When the structures have been completed, ask each child to estimate, measure and record the volume. The cards can then be placed in the activity centre for other children to use.



☐ ☐ ☐

Have each child select five of the boxes on display in the activity centre, and order them according to greatest and least estimated volume. Instruct the children to prepare charts such as the following:

Box	Estimate	Measurement
Perfume	$8\ cm^3$	$12\ cm^3$

The children fill their respective boxes with 1 cm cubes to determine the volume of each, compare the estimated and actual volumes, and adjust the original order of the five boxes accordingly.

For Your Notes

Unit 3 Section 11 Lesson 4

Exploring the Kilometre

Materials

- several metre sticks
- trundle wheel
- for each group of three or four children
  - road map
- for each child
  - ruler

Lesson

1

Seat the children around the working area. Distribute centimetre rulers and recording materials. Recall the centimetre.

Look at your ruler.
Look at the length of 1 cm.
Turn your ruler face down.
Draw a line that you think is 1 cm *long.*
Now measure your line.
How close were you?
Try again.

Repeat for 5 cm, 10 cm and 20 cm.

2

Recall the metre.

Show the metre stick.

How many centimetres long is a metre stick?
What kinds of things would you use a metre stick to measure?
What kinds of things would you measure with a centimetre ruler?

Have the children estimate the length of various objects in the classroom in centimetres or metres and use rulers or metre sticks to measure them.

3

Ask several children to estimate the length of the classroom in metres. Record each child's estimate on the easel.

Leona – 6 m
Jeff – 10 m

If one is available, show the trundle wheel and explain how it is used. Invite a child to use the wheel to measure the length of the classroom. Record the distance on the easel so that the children can compare their estimates with the actual distance in metres.

4

Write on the easel
kilometre km

Show a metre stick, saying

A line 1000 times as long as this metre stick is 1 km.
Francis, what distances do you know that are measured in kilometres?

The children have probably noticed road signs giving distances in kilometres. Discuss distances between familiar landmarks or nearby villages, suburbs or cities.

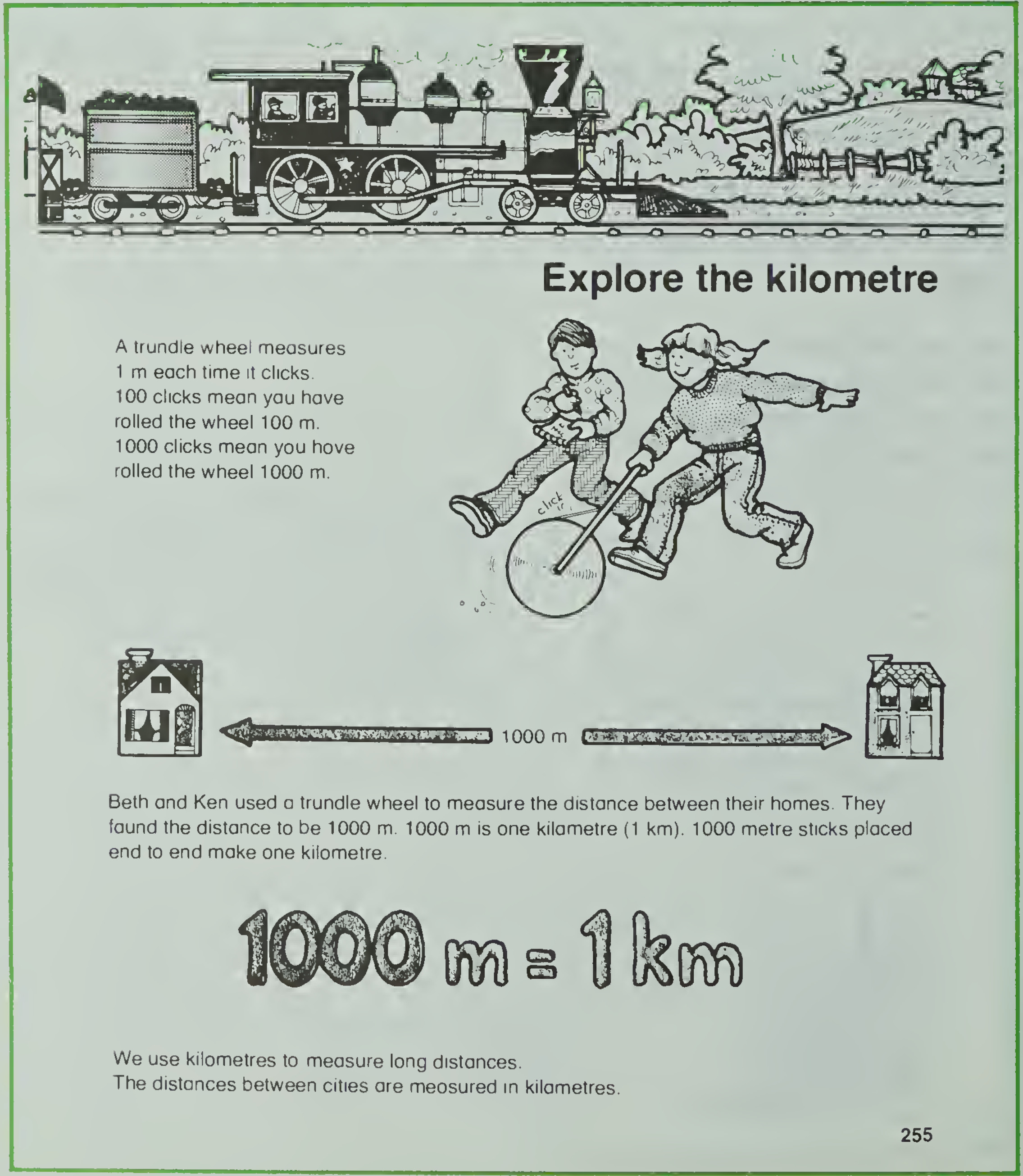
Would it be convenient to measure such distances with a metre stick or with a centimetre ruler? Why not?

5

Take the children on a walk 1 km long. Again if a trundle wheel is available invite different children to use it to measure the distance. Encourage the children to keep an accurate count as the wheel is passed from one child to another. Otherwise pre-measure a 1 km distance using an automobile odometer.

6

Take the children into the hall. Have each child estimate its length in metres. Give one child the trundle wheel to measure the distance. Discuss with the children how many times one would have to walk up and down the



Explore the kilometre

A trundle wheel measures 1 m each time it clicks. 100 clicks mean you have rolled the wheel 100 m. 1000 clicks mean you have rolled the wheel 1000 m.

Beth and Ken used a trundle wheel to measure the distance between their homes. They found the distance to be 1000 m. 1000 m is one kilometre (1 km). 1000 metre sticks placed end to end make one kilometre.

1000 m = 1 km

We use kilometres to measure long distances.
The distances between cities are measured in kilometres.

255

hall in order to walk a distance of 1 km. If the prospect seems interesting, two children could be assigned the task of measuring 1000 m and reporting the number of trips to the class. (In an average school, the 1 km journey would require 15 to 20 trips.)

Written and Other Activities

☐

mathways 3, pages 255, 256
Have the children read and discuss the information on page 255 before assigning the estimation problems on page 256. When the children have finished, have them read their answers so that they can compare estimates.

☐ ☐

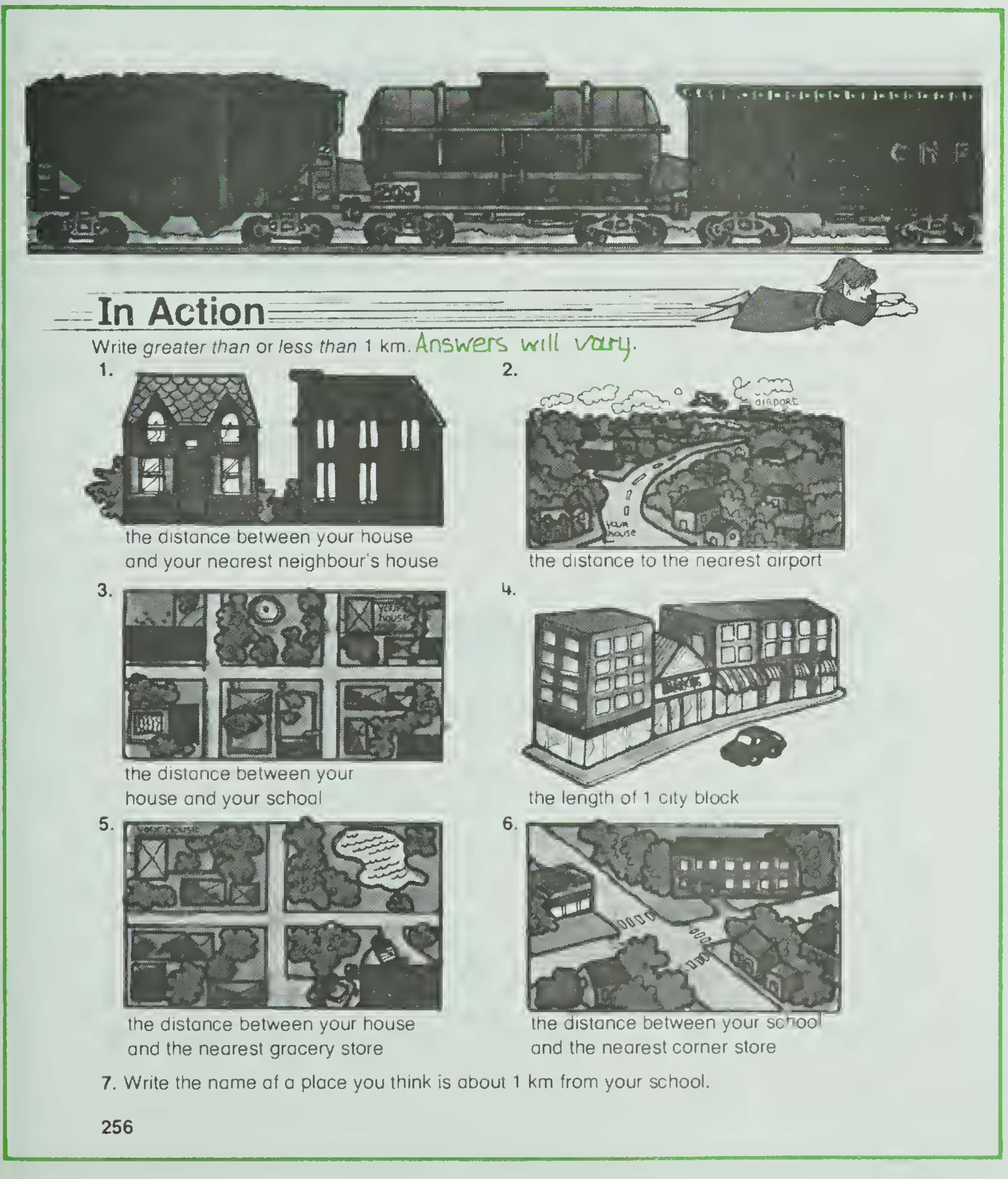
Discuss the odometer and its use. Assign each child in the group the task of reporting the number of kilometres registered at a school bus pick-up point and the number recorded at drop-off points. Ask the children to record the figures so that they will not be forgotten. These can be discussed the following day and the number of kilometres between the school stop and various stops on the route to school can be determined. Assign other children the task of recording the number of kilometres on the car odometer at the start and finish points of family excursions.

☐ ☐ ☐

Have pairs of children measure the distance around the school yard with the trundle wheel.

☐ ☐ ☐ ☐

Give each group of three or four children a simple hand-drawn map showing the distance between a few well known cities and villages in the province, and have each group report the number of kilometres between specific localities. The chart could then be used as a basis for estimating or comparing distances between other localities.



In Action

Write *greater than* or *less than* 1 km. Answers will vary.

1. the distance between your house and your nearest neighbour's house
2. the distance to the nearest airport
3. the distance between your house and your school
4. the length of 1 city block
5. the distance between your house and the nearest grocery store
6. the distance between your school and the nearest corner store
7. Write the name of a place you think is about 1 km from your school.

256

Unit 3 Section 12 Lesson 1

Adding Decimals: Sums Greater Than One

Materials

- display-size number line
- for each child
  - sheet of number lines reproduced from Program Master 30

Rationale

Earlier lessons in *mathways 3* were structured around relating decimal tenths to points on a number line. In these lessons the children learned to show the addition of decimal addends whose sums are less than one. This lesson introduces the children to adding decimals whose sums are greater than one, and again, the number line is used for the initial presentation.

The first activity in the lesson provides a brief review of using a number line to add decimals whose sums are less than one. If the children's performance in completing *mathways 3* page 257 indicates that the meaning of decimals is not clear, a more thorough review can be designed to meet the needs of a particular group by selecting activities provided for pages 164 to 166.

Lesson

1

Gather the children around the easel. Give each child a copy of Program Master 30. Draw a number line, and mark and label the points 0.0, 0.1 and 0.2. Have children read the decimal numerals aloud.

Zero decimal one, zero decimal two.

Have the children label a number line in the same way. Mark but do not label the next point.

Carrie, what name shall I give to this point on the number line?

Label the point 0.3. Continue marking and labelling and having the children mark and label on their personal number lines the points to 2.1. Discuss with the children that each number can be represented in three ways: by the spoken name, the written symbol, and the physical representation.

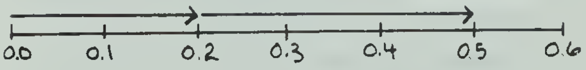
2

Write an addition question on the easel

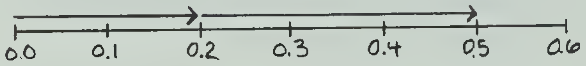
Add.

$$\begin{array}{r} 0.2 \\ +0.3 \\ \hline \end{array}$$

Illustrate the addition on the number line:



Have the children illustrate the same question on their number lines.



Record the sum on the easel.

Add.

$$\begin{array}{r} 0.2 \\ +0.3 \\ \hline 0.5 \end{array}$$

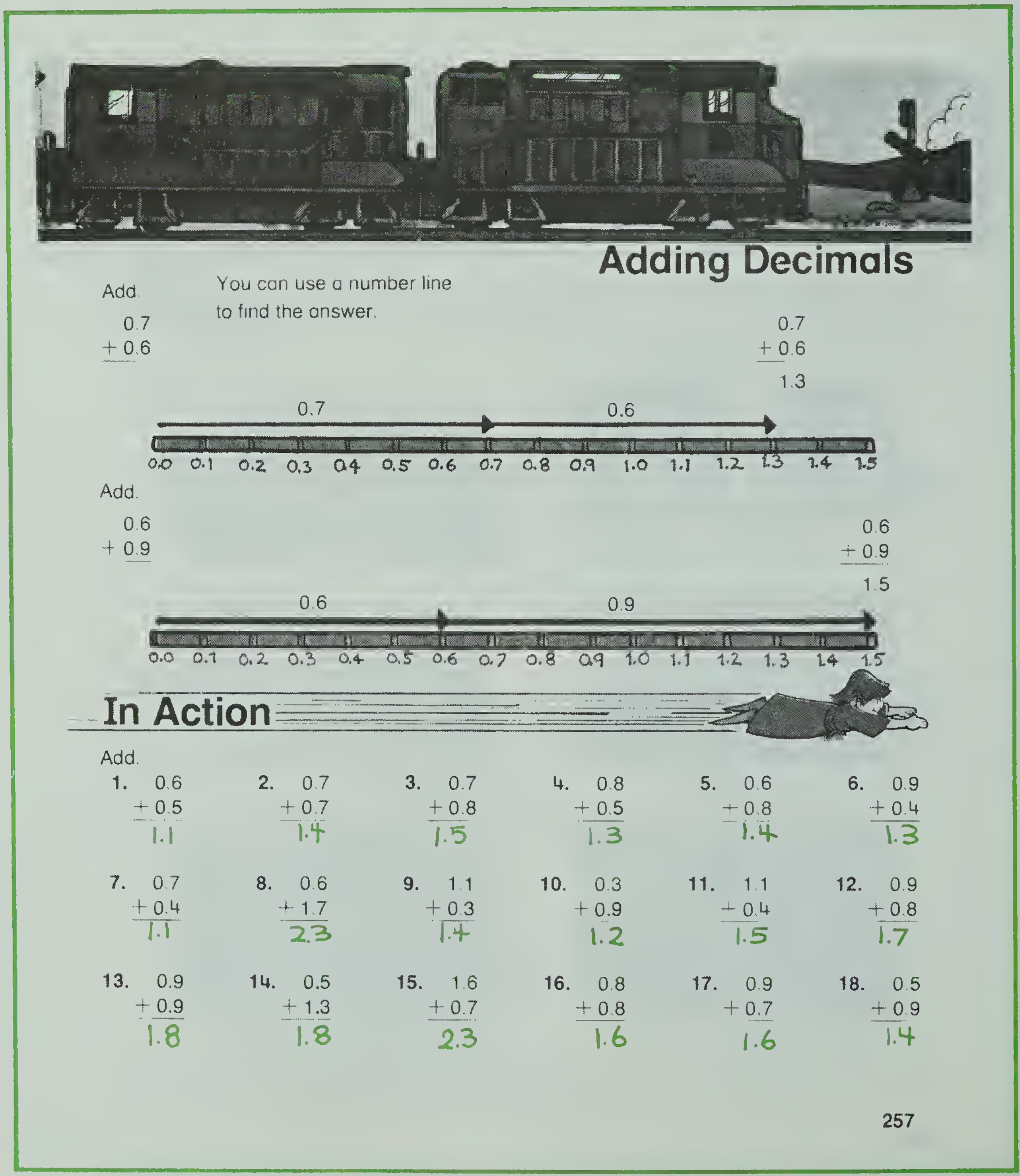
Write other addition questions on the easel and have children draw the arrows on their number lines. Record the sums.

3

After a suitable period of review, have the children use their number lines to illustrate the addition of decimal addends whose sums are greater than ones. Write a question on the easel.

Add.

$$\begin{array}{r} 0.6 \\ +0.8 \\ \hline \end{array}$$



Adding Decimals

Add.

$$\begin{array}{r} 0.7 \\ +\ 0.6 \\ \hline \end{array}$$

You can use a number line to find the answer.

$$\begin{array}{r} 0.7 \\ +\ 0.6 \\ \hline 1.3 \end{array}$$

Add.

$$\begin{array}{r} 0.6 \\ +\ 0.9 \\ \hline \end{array}$$

$$\begin{array}{r} 0.6 \\ +\ 0.9 \\ \hline 1.5 \end{array}$$

In Action

Add.

1. 0.6 + 0.5 1.1	2. 0.7 + 0.7 1.4	3. 0.7 + 0.8 1.5	4. 0.8 + 0.5 1.3	5. 0.6 + 0.8 1.4	6. 0.9 + 0.4 1.3
7. 0.7 + 0.4 1.1	8. 0.6 + 1.7 2.3	9. 1.1 + 0.3 1.4	10. 0.3 + 0.9 1.2	11. 1.1 + 0.4 1.5	12. 0.9 + 0.8 1.7
13. 0.9 + 0.9 1.8	14. 0.5 + 1.3 1.8	15. 1.6 + 0.7 2.3	16. 0.8 + 0.8 1.6	17. 0.9 + 0.7 1.6	18. 0.5 + 0.9 1.4

257

Have the children draw the arrows.
Record the sum.
Repeat the activity several times. Include questions in which one addend is greater than one; for example 1.5 + 0.3 and 0.4 + 1.2.

Written and Other Activities

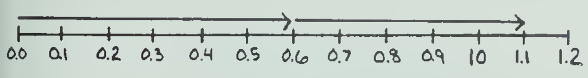
☐

mathways 3, page 257

Have children explain each of the examples in their own words before assigning the In Action questions. Provide each child with two copies of Program Master 30. Ask the children to illustrate each question in the In Action and use the answers from the number lines to complete the questions.

☐ ☐

Give each child a sheet of number lines reproduced from Program Master 30. Instruct the children to select three questions on *mathways 3* page 166 and three questions on *mathways 3* page 257 to illustrate on number lines.



☐ ☐ ☐

mathways 3 Plus Workbook page 87

For Your Notes

Unit 3 Section 12 Lesson 2

Exchanging 10 Tenths for One

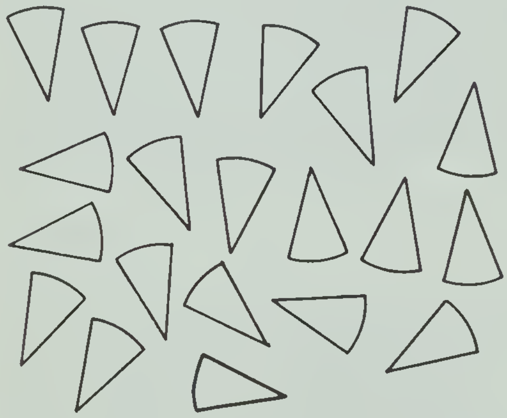
Materials

- six fractional pies reproduced from Program Master 33: three whole pies and three pies cut into tenths
- for each group of four children
  - 88 fractional tenths cut from Program Master 33
  - die marked
    13 tenths, 14 tenths, 18 tenths
    20 tenths, 21 tenths, 22 tenths
  - die marked, for example
    17 tenths, 28 tenths, 34 tenths
    45 tenths, 51 tenths, 93 tenths
  - provide four dice, each showing different numbers of tenths, so that the groups can exchange after several rounds

Lesson

1

Gather the children around the working area and scatter 21 pie tenths on the floor.



Write *0.1* on the easel and, pointing to the pie sections, say

Each of the pie tenths on the floor represents zero decimal one.

Count the tenths, please, John, and record the number on the easel.

The child counts, says *There are 21 tenths,* and writes *21 tenths* on the easel.

Say

Vera, pick up 10 tenths and give them to me, please.

When the child completes the task, give a whole fractional pie in exchange.

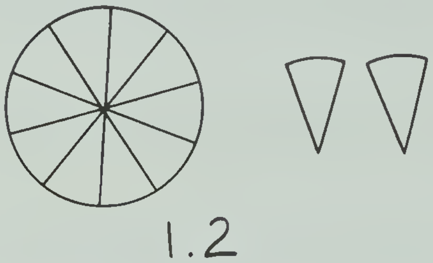
Ten pie sections equal one whole pie. Put this pie on the floor, please, to replace the 10 tenths.

Repeat the procedure until only one pie tenth remains on the floor.

Write *2.1* on the easel

Pointing to each digit and the decimal point, say

Two wholes, one tenth, two decimal one.



Discuss with the children that this means either two wholes and one tenth or 21 tenths.

2

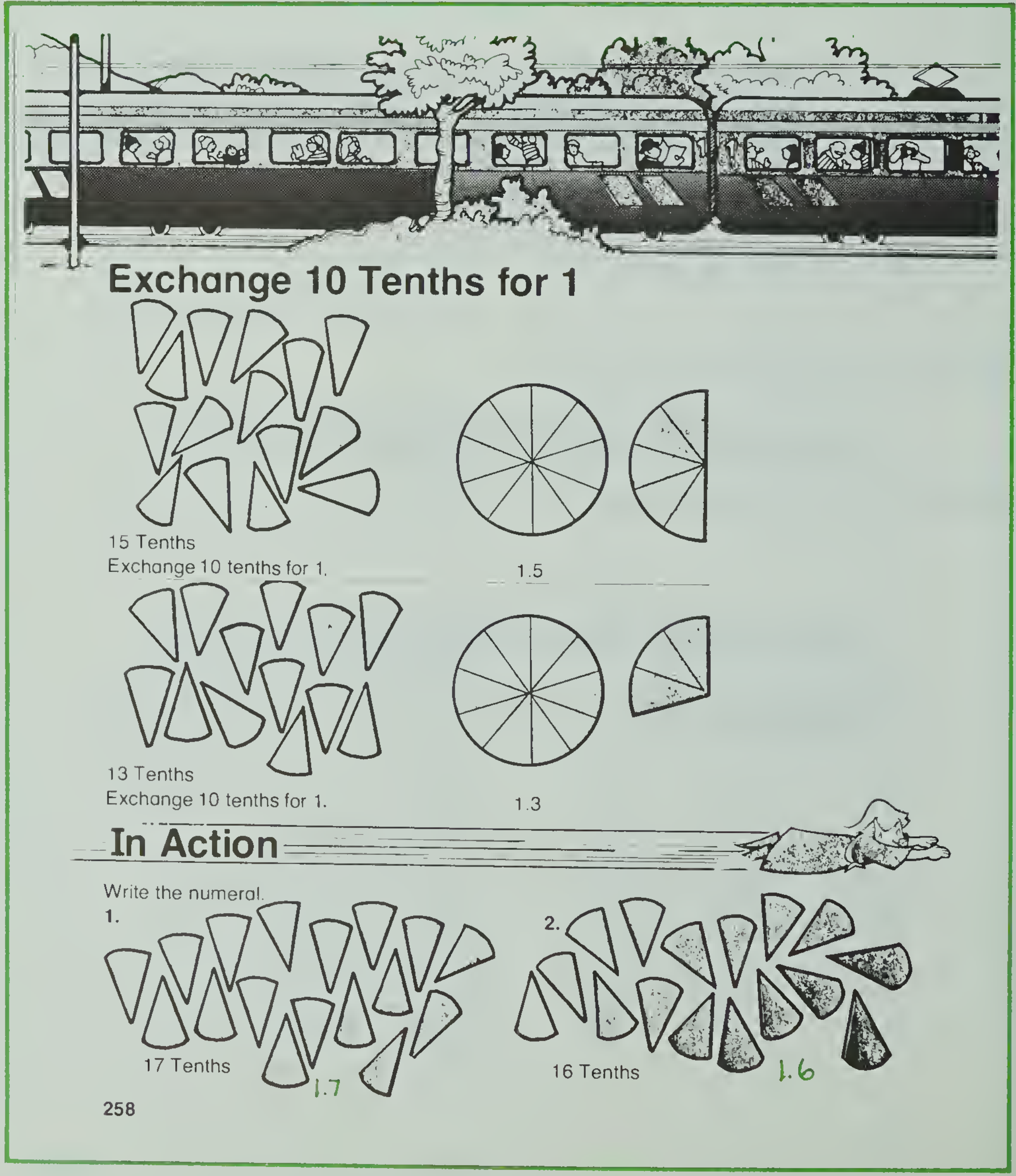
Put other groups of pie tenths on the floor, varying the number from 10 through 30. Follow the procedure described in activity 1 so that the children will experience exchanging tenths and writing whole numbers and decimal numbers to 3; for example *1.0, 1.1, . . ., 2.9, 3.0.* Each time stress both meanings.

3

Remove the whole pies and pie pieces from the working area. Write on the easel

24 tenths

Ask



Exchange 10 Tenths for 1

15 Tenths
Exchange 10 tenths for 1.

1.5

13 Tenths
Exchange 10 tenths for 1.

1.3

In Action

Write the numeral.

1. 17 Tenths 1.7

2. 16 Tenths 1.6

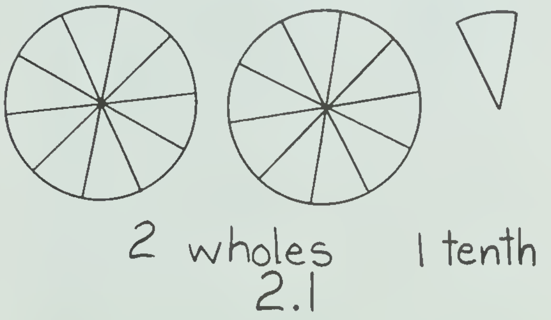
258

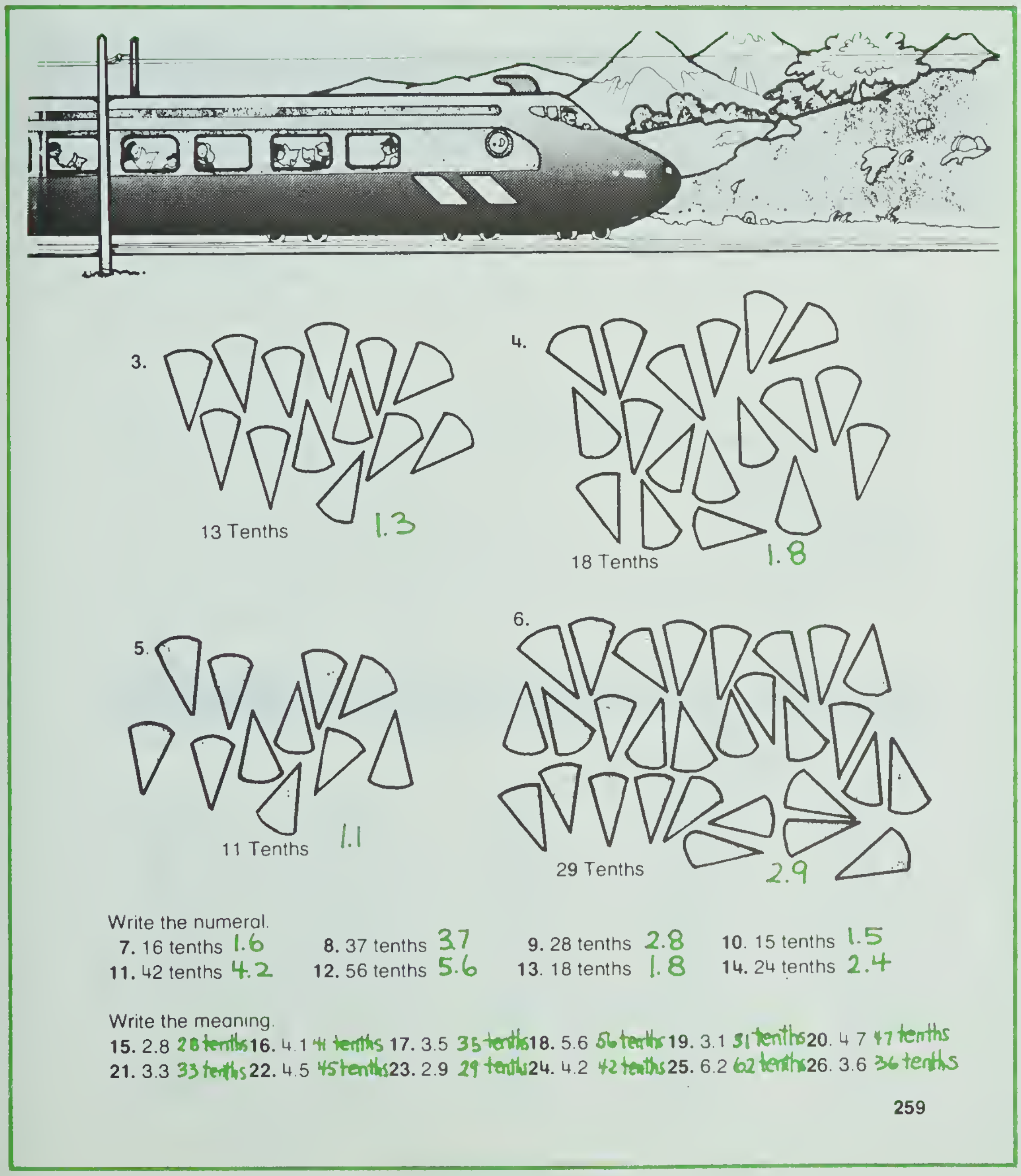
What is the name of the decimal number for 24 tenths, Charlene?
The child responds
Two decimal four.
Have the child write 2.4 on the easel. Repeat, using examples ranging from 10 tenths to 90 tenths.

4
Write 3.6 on the easel.
Read this number, please, Helene.
The child responds
Three decimal six.
Ask
How many wholes and how many tenths?
Write on the easel
3.6 means 3 wholes and 6 tenths or 36 tenths.

Repeat, using examples that range from 1.1 to 9.9.

5
Write on the easel
12 tenths *11 tenths* *20 tenths*
17 tenths *10 tenths* *29 tenths*
Have the children each copy two or three expressions from the easel and illustrate each by drawing whole pies and pie tenths. Have them label each picture with the decimal numeral.




3.
13 Tenths 1.3

4.
18 Tenths 1.8

5.
11 Tenths 1.1

6.
29 Tenths 2.9

Write the numeral.
7. 16 tenths 1.6 **8.** 37 tenths 3.7 **9.** 28 tenths 2.8 **10.** 15 tenths 1.5
11. 42 tenths 4.2 **12.** 56 tenths 5.6 **13.** 18 tenths 1.8 **14.** 24 tenths 2.4

Write the meaning.
15. 2.8 28 tenths **16.** 4.1 41 tenths **17.** 3.5 35 tenths **18.** 5.6 56 tenths **19.** 3.1 31 tenths **20.** 4.7 47 tenths
21. 3.3 33 tenths **22.** 4.5 45 tenths **23.** 2.9 29 tenths **24.** 4.2 42 tenths **25.** 6.2 62 tenths **26.** 3.6 36 tenths

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To facilitate the children drawing pie tenths, templates might be prepared. These can be prepared by having the children trace and cut out a personal copy from a model of a suitable size.

Written and Other Activities

☐

mathways 3, pages 258, 259
For each page, discuss the examples and relate each picture to a decimal number.

☐ ☐

To each group of four children give a marked die showing 13, 14, 18, 20, 21 and 22 tenths. Give each child in the group 22 pie tenths. The group members take turns tossing the die. After each toss, the children select the number of pie tenths indicated by the die and assemble them to show the decimal.

☐ ☐ ☐

Give one group of four children a marked die showing 12, 28, 34, 45, 51, and 93 tenths. Give each of the other groups a die showing different numbers of tenths. The children take turns tossing the die and stating the decimal number indicated on the face of the die, the number of wholes and tenths and the total number of tenths. If the die tossed by a child shows *17 tenths,* the child says *One decimal seven, one whole and seven tenths or 17 tenths.* After a number of rounds, have the groups exchange dice.

☐ ☐ ☐ ☐

Have the children draw place-value charts on which to record the numbers given in questions 3 to 26 on *mathways 3* page 259.

ones	tenths
1	3
1	8
1	1
2	9

Unit 3 Section 12 Lesson 3

Adding Decimals: Exchanging 10 Tenths for One Whole

Materials

- for each child
  - copy of stencil, *see* ☐ ☐
- for a pair of children
  - gameboard, *see* ☐ ☐ ☐
  - die marked 0.1 to 0.6
  - two red markers
  - two blue markers

Lesson

1

Gather the children around the working area. Write on the easel

Add.

3.7 3 and 7 tenths
+4.2 4 and 2 tenths

Pointing to the appropriate addends on the easel, say

Three decimal seven means three wholes and seven tenths.
Four decimal two means four wholes and two tenths.

Through questioning have the children complete the addition question, beginning with the place-value meaning and moving to the standard form.

Add.

3.7 3 and 7 tenths
+4.2 4 and 2 tenths
7.9 7 and 9 tenths

Write other addition questions that do not require regrouping. Involve children in completing them and have the whole group record each step in their notebooks.

2

Write an addition question that requires exchanging 10 tenths for one whole, using standard form. Have a child write the place-value meaning of the addends and the sum.

Add.

2.6 2 and 6 tenths
+1.8 1 and 8 tenths
3 and 14 tenths

Through questioning establish that since there are more than nine tenths, 10 tenths must be exchanged for one whole. Have the place-value meaning of the sum rewritten to show the exchange, then the sum written in decimal form.

Add.

2.6 2 and 6 tenths
+1.8 1 and 8 tenths
4.4 3 and 14 tenths
or
4 and 4 tenths

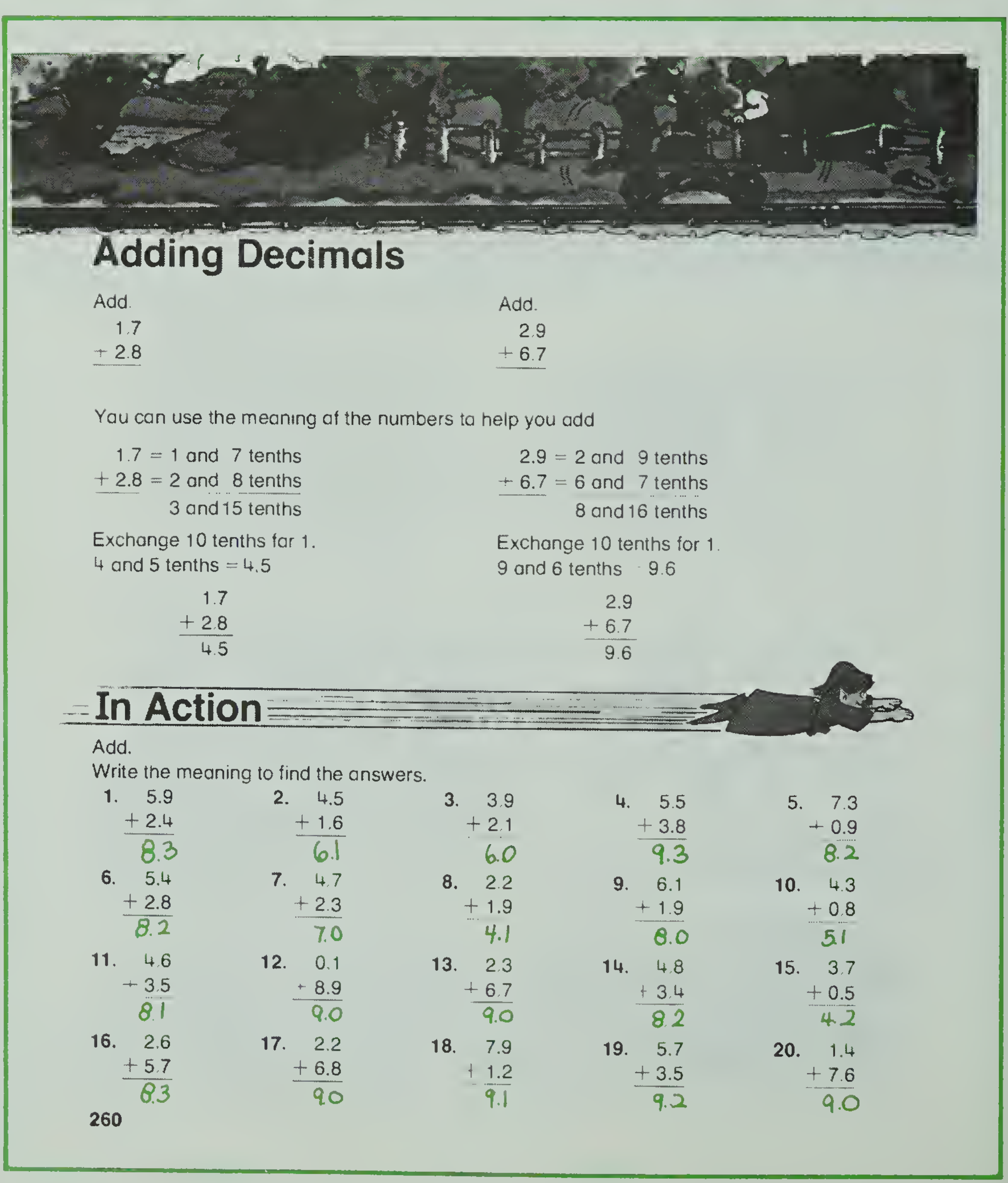
Have all the children record each step in their notebooks. Continue the activity, involving children in completing and recording each step for several other questions that require an exchange.

3

Write two addition questions on the easel, one that requires an exchange and one that does not.

Do you think that both of these questions will require an exchange of 10 tenths for one whole?
Which question will require an exchange?
How do you know that?

Have children complete the questions on the easel, following the steps described in activities 1 and 2.



Adding Decimals

Add.
1.7
+ 2.8

Add.
2.9
+ 6.7

You can use the meaning of the numbers to help you add

1.7 = 1 and 7 tenths
+ 2.8 = 2 and 8 tenths
3 and 15 tenths
Exchange 10 tenths for 1.
4 and 5 tenths = 4.5
1.7
+ 2.8
4.5

2.9 = 2 and 9 tenths
+ 6.7 = 6 and 7 tenths
8 and 16 tenths
Exchange 10 tenths for 1.
9 and 6 tenths = 9.6
2.9
+ 6.7
9.6

In Action

Add.
Write the meaning to find the answers.

1. 5.9 + 2.4 8.3	2. 4.5 + 1.6 6.1	3. 3.9 + 2.1 6.0	4. 5.5 + 3.8 9.3	5. 7.3 + 0.9 8.2
6. 5.4 + 2.8 8.2	7. 4.7 + 2.3 7.0	8. 2.2 + 1.9 4.1	9. 6.1 + 1.9 8.0	10. 4.3 + 0.8 5.1
11. 4.6 + 3.5 8.1	12. 0.1 + 8.9 9.0	13. 2.3 + 6.7 9.0	14. 4.8 + 3.4 8.2	15. 3.7 + 0.5 4.2
16. 2.6 + 5.7 8.3	17. 2.2 + 6.8 9.0	18. 7.9 + 1.2 9.1	19. 5.7 + 3.5 9.2	20. 1.4 + 7.6 9.0

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Written and Other Activities

☐

mathways 3, page 260

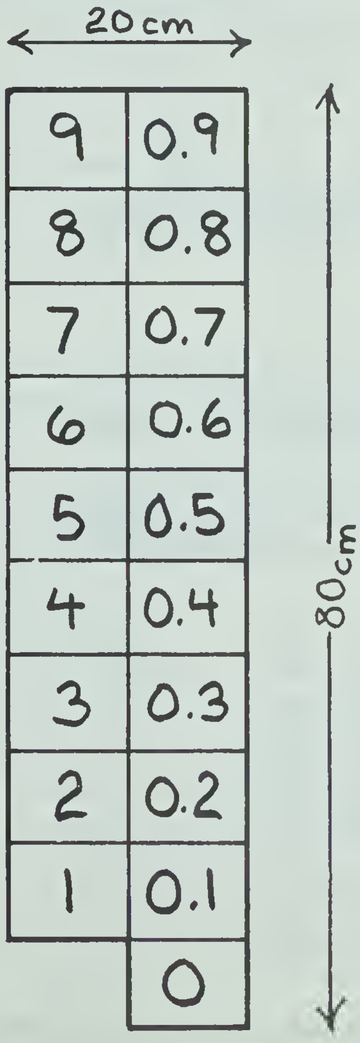
Involve the children in discussing the examples, discussing that exchanges are necessary only when there are more than nine tenths in the right-hand column.

☐ ☐

Prepare a stencil of decimal addition questions, mixing questions that require regrouping with questions that do not. Give each child a copy. Before assigning the practice sheet, ask children to try to identify a question that will not require regrouping and give the reasons for their opinions.

☐ ☐ ☐

To reinforce the place-value meaning of decimal addends and provide practice in adding, make a game called *Number Line* for the activity centre. A gameboard such as the following can be made from Bristol board:



Provide a die marked 0.1 to 0.6, two red counters and two blue counters for markers. Each of two players selects a colour and places one marker on 0. Both players, in turn, roll the die and move their markers to the indicated numbers on the board. For following turns, the players roll the die, add the decimal on the die to the decimal marked by the counter on the gameboard and move the counter to show the new number. To pass 0.9, a player places a second counter on 1 and moves the first counter to the number in the tenths column that shows the number of tenths in the sum. For example, if a player's counter is on 0.7 and the player rolls 0.6, a second counter is placed on 1 and the first counter is moved to 0.3 to show the sum 1.3. The first player to reach 9.9 wins the game.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 57

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 88

For Your Notes

Unit 3 Section 12 Lesson 4

Subtracting Decimals

Materials

- for each child
  - sheet of number lines reproduced from Program Master 30

Lesson

1

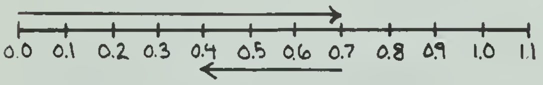
Gather the children around the easel. Distribute copies of Program Master 30. Draw and calibrate a number line to show decimal tenths. Have a child label the calibrations, while other group members label a number line of their own.

Write a subtraction question on the easel.

Subtract.

$$\begin{array}{r}0.7\\ -0.3\\ \hline\end{array}$$

Use the number line to illustrate and explain the subtraction.



Record the difference under the question.

Subtract.

$$\begin{array}{r}0.7\\ -0.3\\ \hline 0.4\end{array}$$

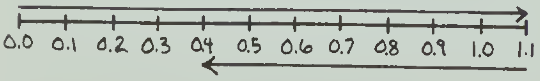
Write another subtraction question with a minuend of less than one. Have the children draw the arrows on their number lines and record the difference. Continue the procedure until the group appears to be comfortable with the technique.

2

Write a subtraction question with a minuend that is greater than one. Have the children draw arrows on their number lines to illustrate the question.

Subtract.

$$\begin{array}{r}1.1\\ -0.7\\ \hline\end{array}$$



Subtract.

$$\begin{array}{r}1.1\\ -0.7\\ \hline 0.4\end{array}$$

Continue the activity, writing other questions in which the minuend is greater than one and the subtrahend is less than one.

Written and Other Activities

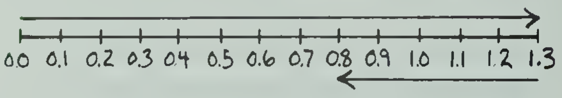
☐

mathways 3, page 261

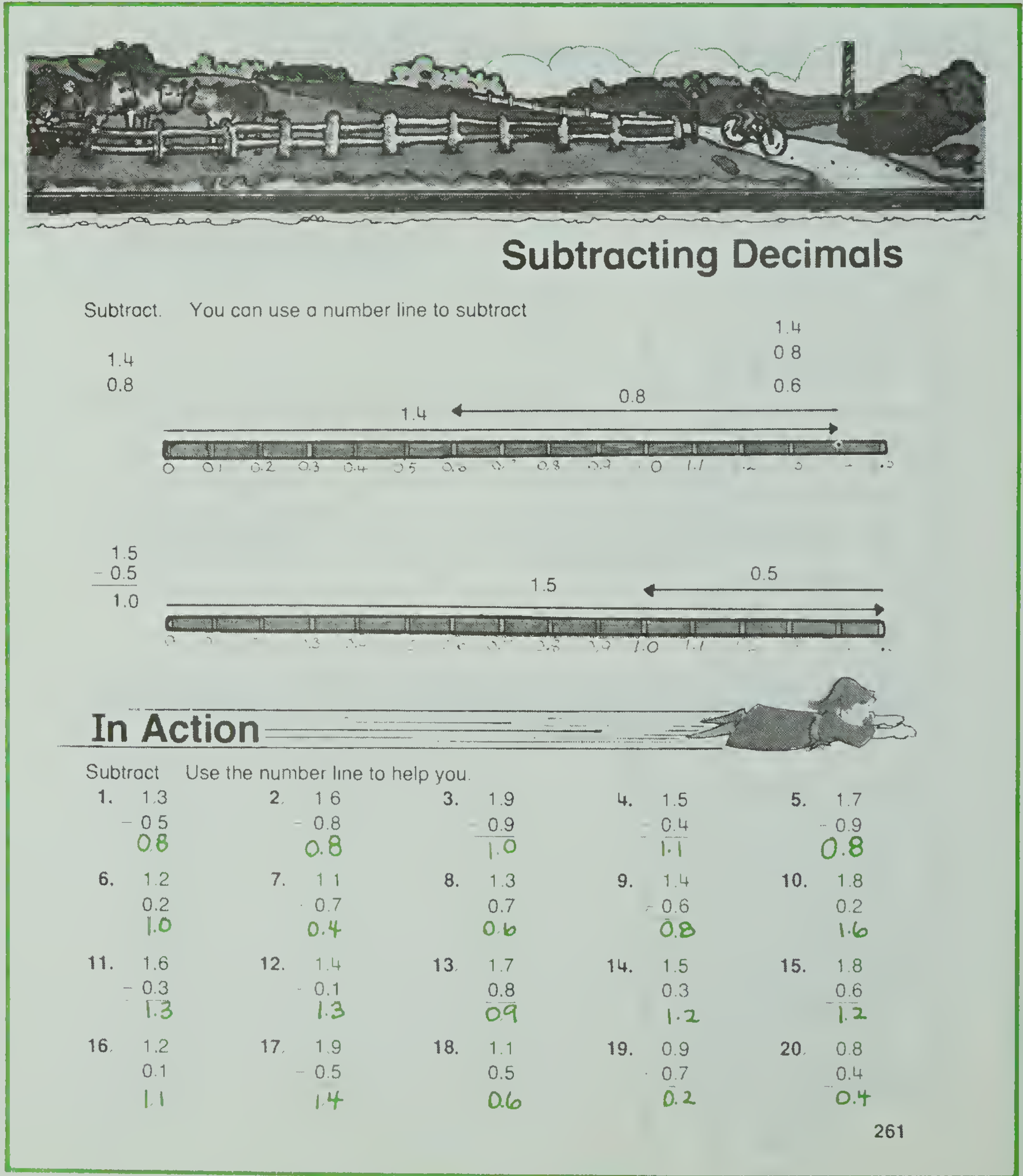
Have children read and explain each of the examples before assigning the In Action questions.

☐ ☐

Give each child a sheet of number lines reproduced from Program Master 30. Have the children select three questions from page 168 of their *mathways* texts, and three questions from page 261. Instruct the children to copy each question, mark a number line to show decimal tenths, draw the arrows to show the subtraction and record the difference.



$$\begin{array}{r}1.3\\ -\ 0.5\\ \hline 0.8\end{array}$$



Subtracting Decimals

Subtract. You can use a number line to subtract

1.4
0.8

1.4
0 8
0.6

$$\begin{array}{r}1.5\\ -\ 0.5\\ \hline 1.0\end{array}$$

In Action

Subtract Use the number line to help you.

1. $\begin{array}{r}1.3\\ -\ 0.5\\ \hline 0.8\end{array}$
2. $\begin{array}{r}1.6\\ -\ 0.8\\ \hline 0.8\end{array}$
3. $\begin{array}{r}1.9\\ -\ 0.9\\ \hline 1.0\end{array}$
4. $\begin{array}{r}1.5\\ -\ 0.4\\ \hline 1.1\end{array}$
5. $\begin{array}{r}1.7\\ -\ 0.9\\ \hline 0.8\end{array}$
6. $\begin{array}{r}1.2\\ 0.2\\ \hline 1.0\end{array}$
7. $\begin{array}{r}1.1\\ -\ 0.7\\ \hline 0.4\end{array}$
8. $\begin{array}{r}1.3\\ 0.7\\ \hline 0.6\end{array}$
9. $\begin{array}{r}1.4\\ -\ 0.6\\ \hline 0.8\end{array}$
10. $\begin{array}{r}1.8\\ 0.2\\ \hline 1.6\end{array}$
11. $\begin{array}{r}1.6\\ -\ 0.3\\ \hline 1.3\end{array}$
12. $\begin{array}{r}1.4\\ -\ 0.1\\ \hline 1.3\end{array}$
13. $\begin{array}{r}1.7\\ 0.8\\ \hline 0.9\end{array}$
14. $\begin{array}{r}1.5\\ 0.3\\ \hline 1.2\end{array}$
15. $\begin{array}{r}1.8\\ 0.6\\ \hline 1.2\end{array}$
16. $\begin{array}{r}1.2\\ 0.1\\ \hline 1.1\end{array}$
17. $\begin{array}{r}1.9\\ -\ 0.5\\ \hline 1.4\end{array}$
18. $\begin{array}{r}1.1\\ 0.5\\ \hline 0.6\end{array}$
19. $\begin{array}{r}0.9\\ -\ 0.7\\ \hline 0.2\end{array}$
20. $\begin{array}{r}0.8\\ 0.4\\ \hline 0.4\end{array}$

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Unit 3 Section 12 Lesson 5

Exchanging 10 Tenths for One

Materials

- six fractional pies reproduced from Program Master 33: three whole pies and three cut into tenths
- for each group of four children – die marked 1.1 to 9.9

Lesson

1

Seat the children around the working area. Scatter 14 pie tenths on the floor in the centre.

Count the pie tenths, please, Ramona, and tell us the total number of tenths.

When the child responds, write *14 tenths* on the easel.

Leslie, please count out 10 tenths and give them to me.

When the child finishes the task, give one whole pie in exchange and have it placed on the floor.

How many whole pies are on the floor?

How many tenths are there?

What decimal number shall I record to show one whole and four tenths?

Record on the easel *1.4.*

2

Put two whole pies and five pie tenths in the centre of the working area.

How many whole pies are there?

How many tenths are there?

Record the decimal and the place-value meaning on the easel.

2 and 5 tenths

2.5

Exchange one whole pie for 10 tenths, arranging them in scatter formation alongside the remaining whole five tenths. Ask a child to state the number of whole pies and the number of tenths. Record the place-value meaning on the easel.

1 and 15 tenths

Referring to the decimal and place-value expressions on the easel and the array of materials on the floor, involve the children in a discussion of why 2.5, 2 and 5 tenths, and 1 and 15 tenths have the same value.

Repeat the demonstration to illustrate decimals ranging from 1.1 to 3.9.

3

Write on the easel

Decimal	*Meaning*
4.6	*3 and 16 tenths*
3.2	
1.8	
2.3	

Have the children explain why the meaning was written that way and what it indicates. After discussion, invite individuals to rewrite the other decimals in the chart to show an exchange of 1 ten for 10 ones.

Change the decimals in the chart and continue the activity.

Written and Other Activities

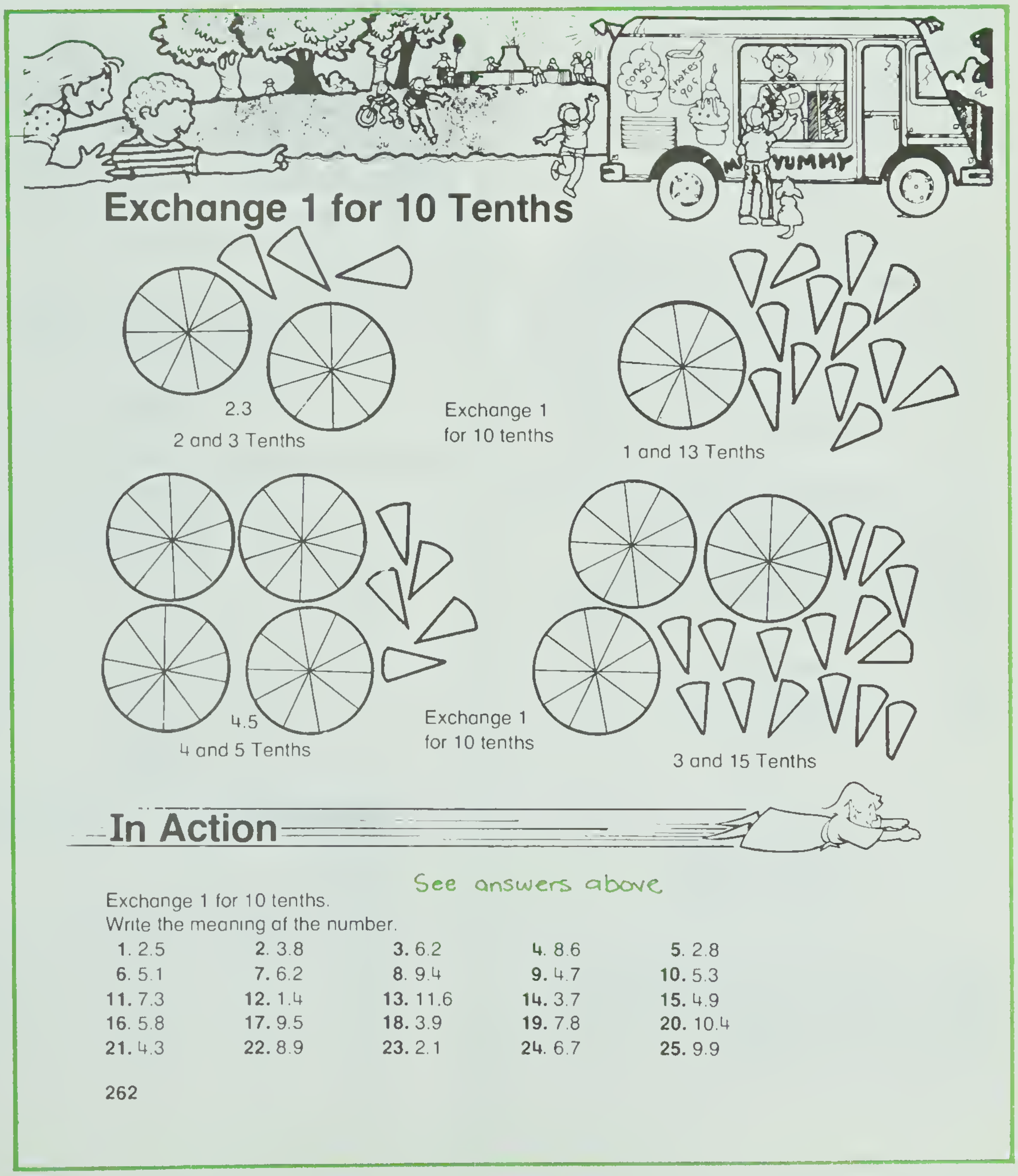
☐

mathways 3, page 262

Have children explain the relationship between the illustrations and the three ways of writing the decimals. For each example, have the children count pies and pie tenths to prove that no change in value results from making an exchange.

Additional Answers

1. 1 and 15 tenths
2. 2 and 18 tenths
3. 5 and 12 tenths
4. 7 and 16 tenths
5. 1 and 18 tenths
6. 4 and 11 tenths
7. 5 and 12 tenths
8. 8 and 14 tenths
9. 3 and 17 tenths
10. 4 and 13 tenths
11. 6 and 13 tenths
12. 0 and 14 tenths
13. 10 and 16 tenths
14. 2 and 17 tenths
15. 3 and 19 tenths
16. 4 and 18 tenths
17. 8 and 15 tenths
18. 2 and 19 tenths
19. 6 and 18 tenths
20. 9 and 14 tenths
21. 3 and 13 tenths
22. 7 and 19 tenths
23. 1 and 11 tenths
24. 5 and 17 tenths
25. 8 and 19 tenths



Exchange 1 for 10 Tenths

In Action

See answers above

Exchange 1 for 10 tenths.
Write the meaning of the number.

1. 2.5 2. 3.8 3. 6.2 4. 8.6 5. 2.8
6. 5.1 7. 6.2 8. 9.4 9. 4.7 10. 5.3
11. 7.3 12. 1.4 13. 11.6 14. 3.7 15. 4.9
16. 5.8 17. 9.5 18. 3.9 19. 7.8 20. 10.4
21. 4.3 22. 8.9 23. 2.1 24. 6.7 25. 9.9

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Unit 3 Section 12 Lesson 6

Subtracting Decimals: Exchanging One Whole for 10 Tenths

Materials

- for each child
  - – copy of stencil, *see* ☐ ☐
- for a pair of children
  - – gameboard, *see* ☐ ☐ ☐
  - – two red counters
  - – two blue counters
  - – die marked 0.1 to 0.6

Lesson

1

Gather the children around the easel in the working area. Write a subtraction question composed of whole numbers and decimals that will not require regrouping. Inviting assistance from the children, rewrite both decimals to show their meaning expressed in wholes and tenths, subtract, then write the difference in standard form. For example

Subtract.

5.8	*5 and 8 tenths*
−4.6	*4 and 6 tenths*
1.2	*1 and 2 tenths*

Have all the children in the group record each step in their notebooks. Use similar questions and continue the activity until the children have worked through a range of examples and seem to feel comfortable with the process.

2

Write a subtraction question that will require regrouping. Repeat the procedure described in activity 1 having each child record the steps.

Subtract.

3.1	*3 and 1 tenth*
−1.5	*1 and 5 tenths*
1.6	

or

2 and 11 tenths
1 and 5 tenths
1 and 6 tenths

Repeat the procedure several times so that the children will have a range of examples of regrouping.

3

Write two questions on the easel, one that requires regrouping and one that does not.

Subtract.

9.6	*9.6*
−1.7	*−1.5*

Kelly, do you think we will have to make an exchange to find the difference for the first question? For the second question?

Ask several children for an opinion, then ask for an explanation. Have each subtraction question completed on the easel, following the steps described in activities 1 and 2. Have all the children record the steps in their notebooks.

Written and Other Activities

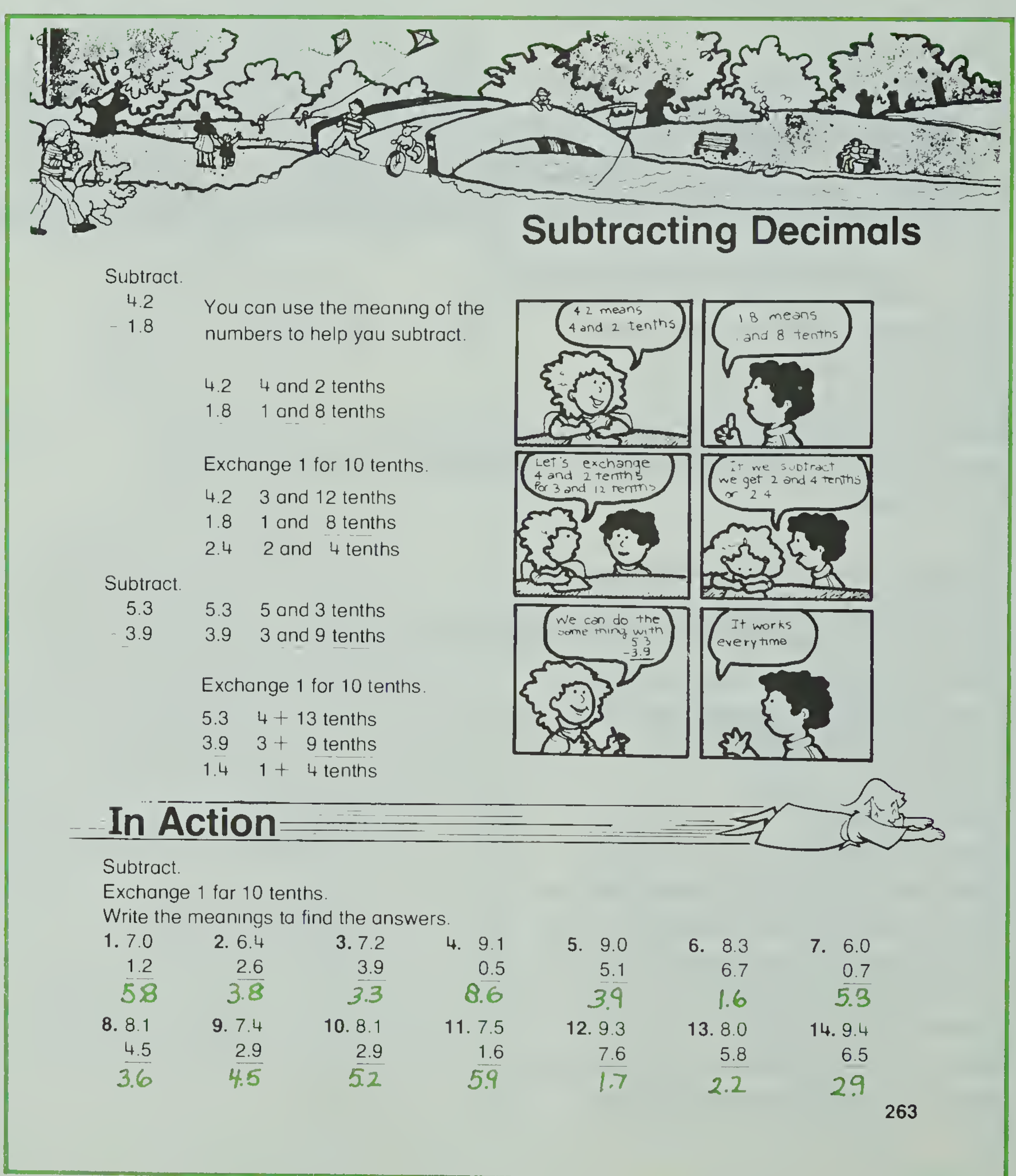
☐

mathways 3, page 263

Discuss each of the examples. Involve children in explaining the steps. Have two or three children describe how they will complete the In Action questions. If there appears to be any confusion, show the children what they are expected to do.

☐ ☐

Prepare a stencil of subtraction questions composed of whole numbers and decimal tenths. Include examples that do and do not require regrouping. Give each child a copy and ask



Subtracting Decimals

Subtract.
4.2
− 1.8

You can use the meaning of the numbers to help you subtract.

4.2	4 and 2 tenths
1.8	1 and 8 tenths

Exchange 1 for 10 tenths.

4.2	3 and 12 tenths
1.8	1 and 8 tenths
2.4	2 and 4 tenths

Subtract.
5.3
− 3.9

5.3	5 and 3 tenths
3.9	3 and 9 tenths

Exchange 1 for 10 tenths.

5.3	4 + 13 tenths
3.9	3 + 9 tenths
1.4	1 + 4 tenths

4 2 means 4 and 2 tenths

1 8 means 1 and 8 tenths

Let's exchange 4 and 2 tenths for 3 and 12 tenths

If we subtract we get 2 and 4 tenths or 2 4

We can do the same thing with 5 3 −3.9

It works every time

In Action

Subtract.
Exchange 1 far 10 tenths.
Write the meanings ta find the answers.

1. 7.0	**2.** 6.4	**3.** 7.2	**4.** 9.1	**5.** 9.0	**6.** 8.3	**7.** 6.0
1.2	2.6	3.9	0.5	5.1	6.7	0.7
5.8	3.8	3.3	8.6	3.9	1.6	5.3
8. 8.1	**9.** 7.4	**10.** 8.1	**11.** 7.5	**12.** 9.3	**13.** 8.0	**14.** 9.4
4.5	2.9	2.9	1.6	7.6	5.8	6.5
3.6	4.5	5.2	5.9	1.7	2.2	2.9

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Do we have to exchange one whole for 10 tenths to find the difference for all subtraction questions?
Can you see one question on the paper that will not require an exchange?
After discussion, have the children complete the questions.

☐ ☐ ☐

Provide a gameboard, a die marked 0.1 to 0.6, two red markers and two blue markers for a game called *Number Line.*

9	0.9
8	0.8
7	0.7
6	0.6
5	0.5
4	0.4
3	0.3
2	0.2
1	0.1
start	0

Place the game in the activity centre, where two players at a time can use it to practise subtraction skills. Each player chooses a colour and places one marker on 0.9 and one marker on 9. The players, in turn, roll the die and subtract the decimal on the die from the decimal indicated by their respective markers. For the first turn each player will subtract a decimal from 9.9 and move the counters to the numbers on the board that show the difference. To pass 9.0, a player must put the counter in the ones column on the 8 and move the counter in the tenths column to the number that shows the difference. For example, if a player's counters are on 9 and 0.2 (showing 9.2) and the toss turns up 0.4, the player moves the counters to 8 and 0.8 (9.2 − 0.4 = 8.8). To pass 1.0, a similar method is used.
The ones counter is removed and the second counter is moved to the number of tenths in the difference. For example, if the player's counters are on 1 and 0.2 (showing 1.2) and the player rolls 0.5, the counter on 1 is removed and the counter on 0.2 is moved to 0.7 (1.2 − 0.5 = 0.7). The first player to reach 0.0 wins the game.

☐ ☐ ☐ ☐

mathways 3 Practice Masters page 58

☐ ☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 89

For Your Notes

Unit 3 Section 12 Lesson 7

Adding and Subtracting Decimals: Thinking the Exchange

Lesson

1

Seat the children around the working area.

Review thinking the exchange for adding whole numbers. Write on the easel

Add.	*Think*
186	*13*
+257	*6, 14*
443	*3, 4*

After discussion emphasizing the exchanges that occurred, write other whole-number addition questions on the easel, and have children say the "think" numbers and record the sums.

2

Introduce thinking the exchange for adding decimals. Explain that the process is the same as for adding whole numbers. Write an example on the easel.

Add.	*Think*
2.5	*14*
+6.9	*7, 9*

Do the example, explaining each step in the process.

Add.	*Think*
2.5	*14*
+6.9	*7, 9*
7.4	

Have children explain how the "think" numbers relate to the tenths and ones columns. After discussion emphasizing the exchange carried out mentally, write several other examples of decimal addition questions and have the children think the exchanges and record the sums.

3

Recall the procedure for thinking the exchange when subtracting whole numbers.

Introduce thinking the exchange for subtracting decimals. Explain that the procedure is the same as for subtracting whole numbers. Write an example question on the easel and complete it as you explain each step.

Subtract.	*Think*
6.1	*11, 4*
−2.7	*5, 3*
3.4	

Have children explain the relation between the "think" numbers and the tenths and ones columns.

Write several other examples on the easel and have children think the exchanges, say the numbers and record the differences.

Written and Other Activities

☐

mathways 3, page 264

Read and discuss the examples. Have children say the "think" numbers and point to the appropriate digits in the questions. Assign the In Action questions.

☐ ☐

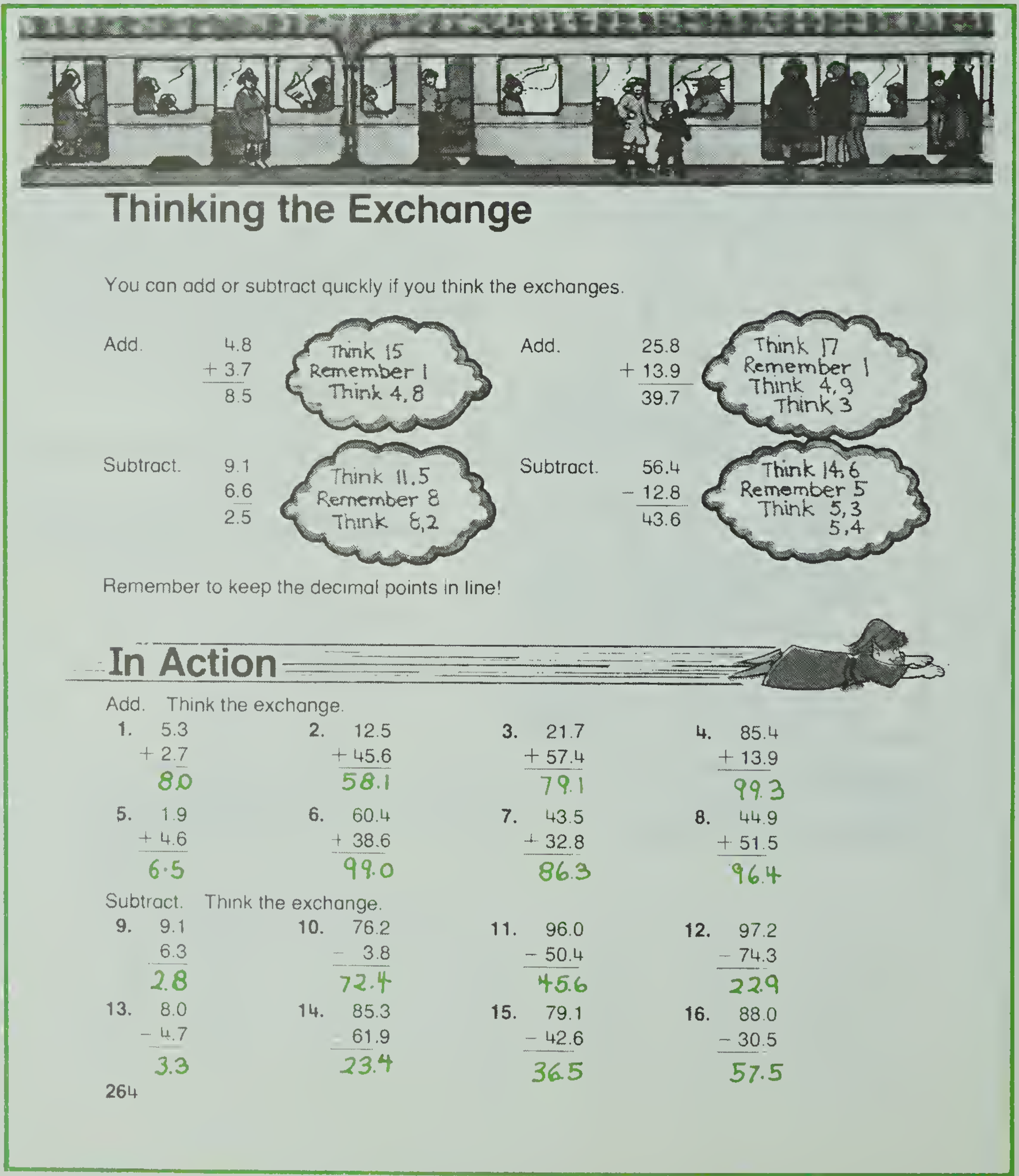
Review the inverse relation between addition and subtraction. Explain that the relationship applies to work with decimals. Have the children check each of three questions on page 264 of the text, using the inverse operation.

☐ ☐ ☐

mathways 3 Practice Masters page 59

☐ ☐ ☐ ☐

mathways 3 Plus Workbook page 90



Thinking the Exchange

You can add or subtract quickly if you think the exchanges.

Add. 4.8 + 3.7 = 8.5
Think 15
Remember 1
Think 4, 8

Add. 25.8 + 13.9 = 39.7
Think 17
Remember 1
Think 4, 9
Think 3

Subtract. 9.1 6.6 = 2.5
Think 11, 5
Remember 8
Think 8, 2

Subtract. 56.4 − 12.8 = 43.6
Think 14, 6
Remember 5
Think 5, 3
5, 4

Remember to keep the decimal points in line!

In Action

Add. Think the exchange.

1. 5.3 + 2.7 8.0	2. 12.5 + 45.6 58.1	3. 21.7 + 57.4 79.1	4. 85.4 + 13.9 99.3
5. 1.9 + 4.6 6.5	6. 60.4 + 38.6 99.0	7. 43.5 + 32.8 86.3	8. 44.9 + 51.5 96.4

Subtract. Think the exchange.

9. 9.1 6.3 2.8	10. 76.2 − 3.8 72.4	11. 96.0 − 50.4 45.6	12. 97.2 − 74.3 22.9
13. 8.0 − 4.7 3.3	14. 85.3 61.9 23.4	15. 79.1 − 42.6 36.5	16. 88.0 − 30.5 57.5

264

Unit 3 Section 13 Lesson 1

Solving Word Problems

Materials

- large map of Canada
- several maps of other cities, showing bus or subway routes
- blank cards

Lesson

1

Gather the children around the working area and initiate a discussion about travel. Encourage the children to tell about experiences they have had while travelling to and from other cities or while using transportation systems in the cities, towns and villages they have visited.

Discuss bicycles, cars, buses, streetcars and walking as methods of travelling in these communities. Ask children about the cost of transportation, distances travelled, and routes taken. During the discussion involving distances or money, use numbers whenever possible. Ask addition questions such as

How much does it cost to take the bus downtown and back?

How far is it from your home to a friend's home and back?

Written and Other Activities

☐

mathways 3, page 265

Give the children a few moments to examine the page. Discuss a subway system. Have children who have experienced riding on any subway tell about it. Then point out Montreal on the map of Canada. Explain that the subway in Montreal is called the Metro. Have the children point out various Metro stops on the map in their texts. Have them trace various routes with their fingers and ask them to state the distance between several points. Allow the children to use the easel to add kilometres to get the answers, if necessary. Have two children in turn read the first problem aloud, and two other children restate the problem in their own words. Explain that sometimes saying a problem in other words helps people to understand it. Have children read and paraphrase each of the problems. Assign the problems, instructing the children to write each answer in a sentence.

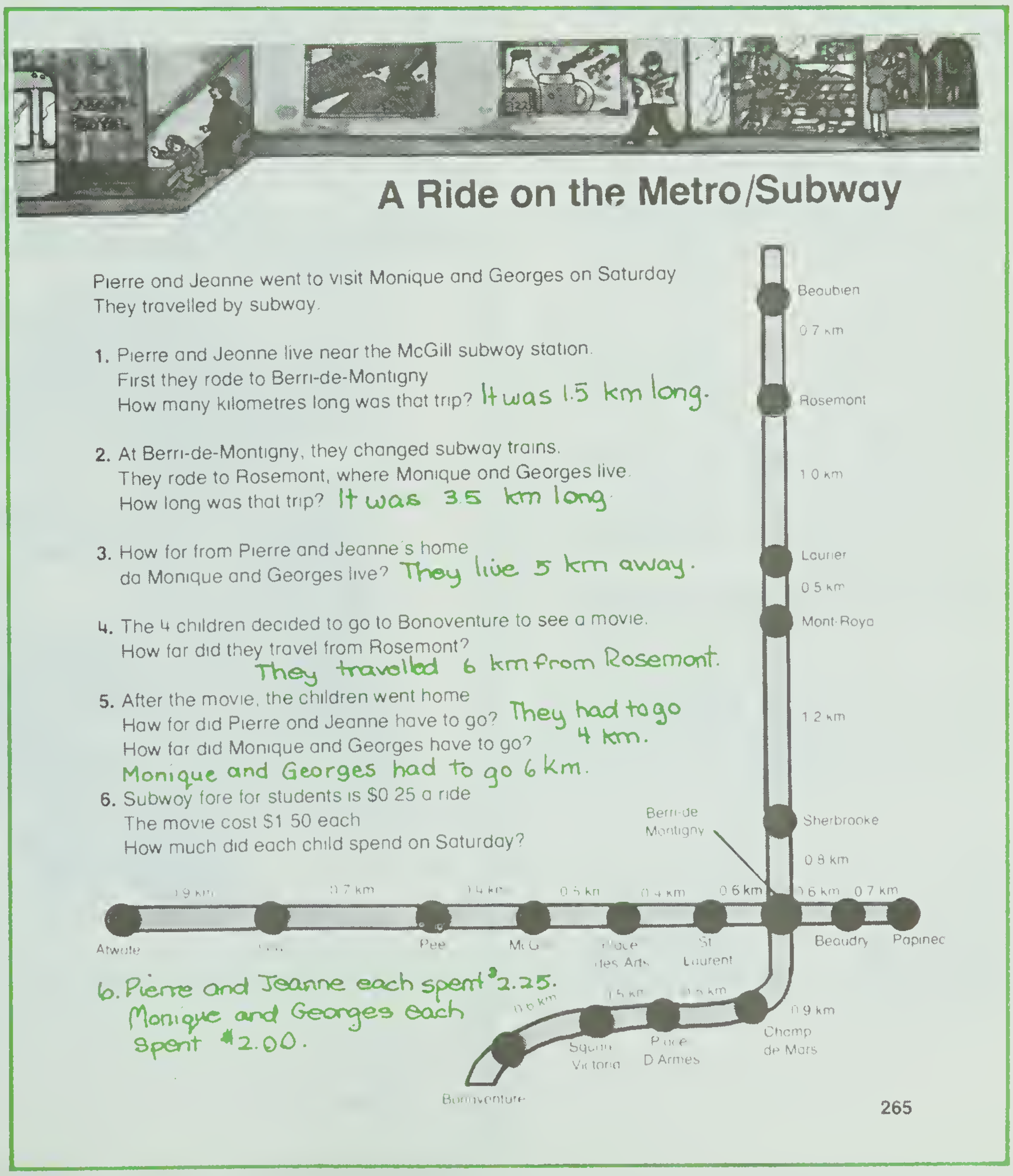
☐ ☐

Have pairs of children take turns asking each other questions about the Metro map on page 265 of their texts. The children can use the problems given as a guide in making up their own questions.

☐ ☐ ☐

Have each child make up and write out two or three problems about the Metro map on *mathways 3* page 265.

The problems can be written on cards given to the children in advance. Have the children exchange cards and solve each other's problems.



A Ride on the Metro/Subway

Pierre and Jeanne went to visit Monique and Georges on Saturday
They travelled by subway.

1. Pierre and Jeanne live near the McGill subway station.
First they rode to Berri-de-Montigny
How many kilometres long was that trip? It was 1.5 km long.

2. At Berri-de-Montigny, they changed subway trains.
They rode to Rosemont, where Monique and Georges live.
How long was that trip? It was 3.5 km long.

3. How far from Pierre and Jeanne's home
do Monique and Georges live? They live 5 km away.

4. The 4 children decided to go to Bonaventure to see a movie.
How far did they travel from Rosemont?
They travelled 6 km from Rosemont.

5. After the movie, the children went home
How far did Pierre and Jeanne have to go? They had to go 4 km.
How far did Monique and Georges have to go?
Monique and Georges had to go 6 km.

6. Subway fare for students is $0.25 a ride
The movie cost $1.50 each
How much did each child spend on Saturday?

6. Pierre and Jeanne each spent $2.25.
Monique and Georges each spent $2.00.

Section 13 Lesson 2

PROBLEM SOLVING

Solving Word Problems

Materials

- large sheet of chart paper, suitable for a class list
- for each child
  - sheet of paper and pencil
- for groups of four
  - gameboard, *see* ☐ ☐
  - four coloured markers: red, yellow, blue, green

Lesson

1

Seat the children around the working area. Ask individuals what kinds of jobs they or their older brothers and sisters have had. They may mention delivering newspapers, cutting lawn, shovelling driveways and walks, babysitting, helping at a store, cleaning the basement, and so on. Invite the children to tell how much money they made, how far they travelled to get to or carry out the job. Encourage them to use numbers when describing distances or amounts of money. Use these numbers for word problems based on the children's experiences.

For example

What route would you take to deliver groceries from a nearby store to a friend's house?

How far did you walk when delivering newspapers?

How much money can you earn by cutting three lawns?

How much money can your brother earn by babysitting for four hours?

2

Have the class work together to develop a list of jobs for children, and the pay for each job.

Job	*Pay*
Delivering papers	*8¢ a paper*
Babysitting	*$1.25 an hour*
Cutting lawns	*$3.75 a lawn*
Washing dishes	*75¢ an hour*
. . .	
. . .	

Post the list prominently. Have the children ask each other questions based on the list.

How much would you make by washing dishes for three hours?

How much can you make by delivering 12 newspapers?

Give each child a pencil and a sheet of paper to record and solve the problems.

Written and Other Activities

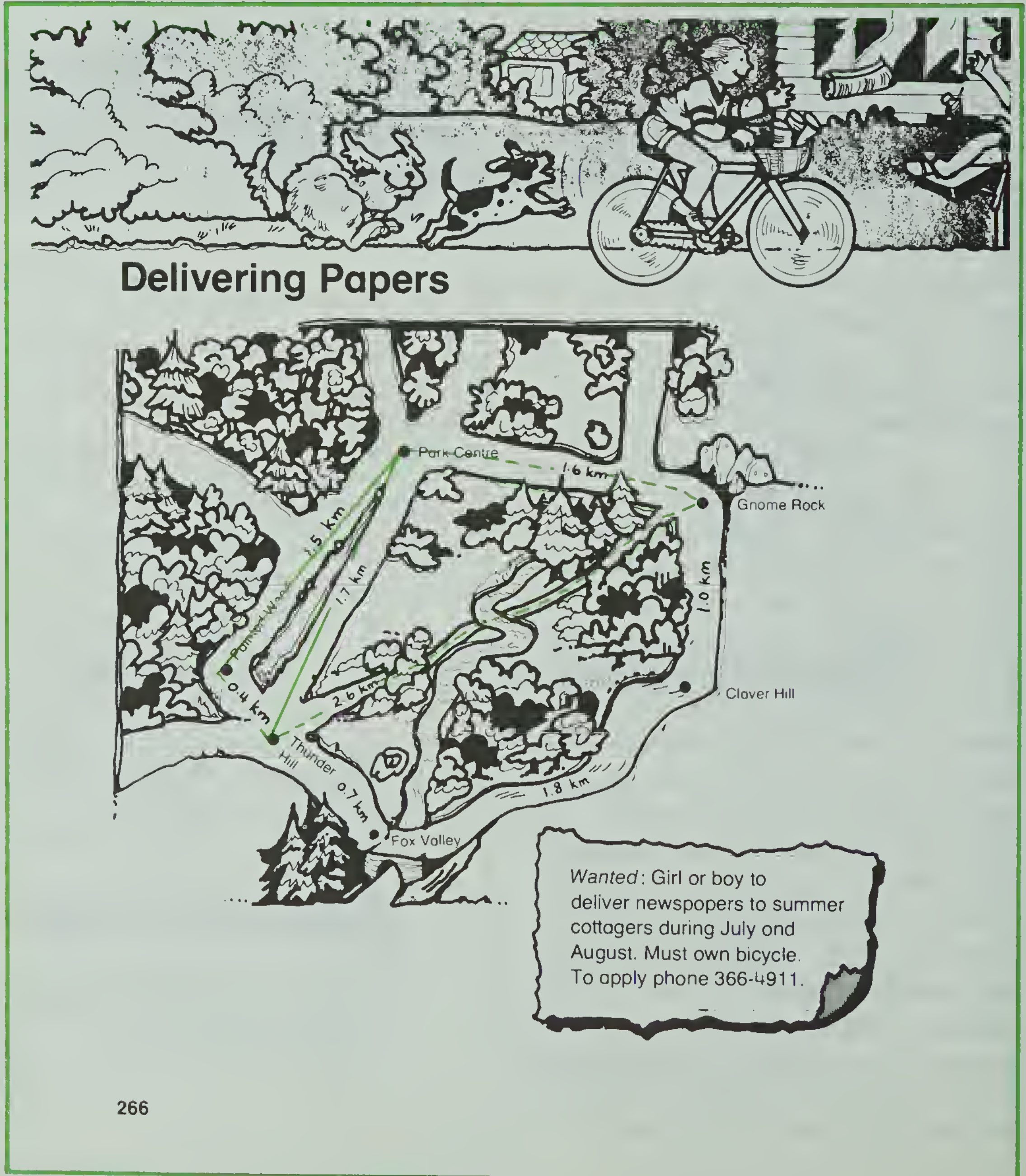
☐

mathways 3, pages 266, 267

Have a child read the advertisement at the bottom of page 266. Ask several children to comment on how they would like to have the job and how the job compares with those listed during the lesson. Discuss the map, and have children trace several routes with their fingers. Ask for the distances between various places shown on the map. For page 267, have a child read the first problem aloud, and have other children restate the problem in their own words. Repeat this for the other problems. Assign the problems, reminding the children to answer each in a sentence.

☐ ☐

The ability to think logically is an important factor in problem solving. The following game can help children to develop that ability.



Delivering Papers

Wanted: Girl or boy to deliver newspapers to summer cottagers during July and August. Must own bicycle. To apply phone 366-4911.

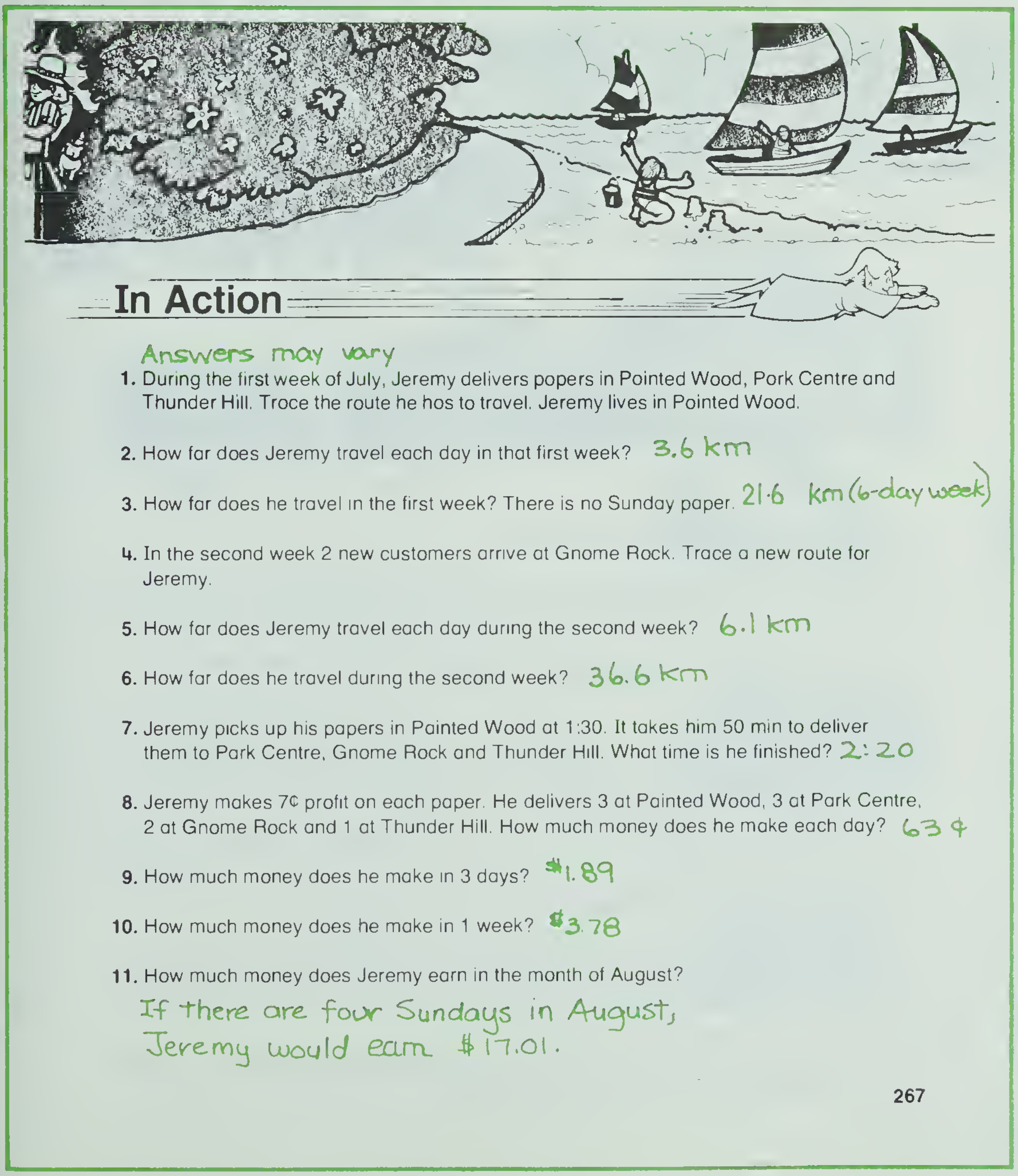
266

Prepare a gameboard as illustrated, and four markers in different colours. Each of four players selects one marker and places it in the appropriate corner. The players take turns moving their markers one space in any direction. A player who lands on a space containing a numeral and an arrow moves the marker that number of spaces in the indicated direction. A player who is blocked by an opposing player while following an arrow loses that turn. Similarly, if a player lands on a square marked X, that turn is lost. The first player to reach the opposite corner is the winner.

R		2↓		3→		2↙		1←	Y
X	1↘		2↙		3↙		2←		1↑
4↓		1←		1↗	X	3→		2↖	X
	3↑	X	2↘		1←	1↗	2↗		1←
1↗		4→		X	X	3←	X	2↓	
	4↗	X	3←	X	X		1↘		2←
3↘		2←	2↙	1↓		3↖		4↑	X
X	3→		3↑	X	1↓		2↙		1↖
1↓		4↗		2←		2↗	X	3↑	
G	1↑		2↗		3←		1→		B

☐ ☐ ☐

Have the children write the problems on *mathways 3* page 267 in their own words. Divide the class into groups of four. Each child in the groups reads his or her version of the problem, and the other children find and state the answer, or question the reader for more information.



In Action

Answers may vary

1. During the first week of July, Jeremy delivers papers in Pointed Wood, Park Centre and Thunder Hill. Trace the route he has to travel. Jeremy lives in Pointed Wood.
2. How far does Jeremy travel each day in that first week? 3.6 km
3. How far does he travel in the first week? There is no Sunday paper. 21·6 km (6-day week)
4. In the second week 2 new customers arrive at Gnome Rock. Trace a new route for Jeremy.
5. How far does Jeremy travel each day during the second week? 6.1 km
6. How far does he travel during the second week? 36.6 km
7. Jeremy picks up his papers in Painted Wood at 1:30. It takes him 50 min to deliver them to Park Centre, Gnome Rock and Thunder Hill. What time is he finished? 2:20
8. Jeremy makes 7¢ profit on each paper. He delivers 3 at Painted Wood, 3 at Park Centre, 2 at Gnome Rock and 1 at Thunder Hill. How much money does he make each day? 63¢
9. How much money does he make in 3 days? $1.89
10. How much money does he make in 1 week? $3.78
11. How much money does Jeremy earn in the month of August?
If there are four Sundays in August, Jeremy would earn $17.01.

267

Unit 3 Section 13 Lesson 3

Drawing Pictures to Help Solve Word Problems

Materials

- catalogues and newspapers
- blank cards

Lesson

1

Gather the children into the working area for a discussion about travelling to and from school. Ask children who take the school bus how long they wait at the bus stop in the morning, how far they travel before arriving at school, what they do while on the bus, and so on. Ask similar questions of children who walk to school. Draw the children into a discussion of their experiences while walking or riding on a bus during class trips. Use these experiences to make up word problems such as the following:

You got on the school bus at 3:30 and arrived home at 4:15. How long did the bus trip take?

Twenty-two grade fours and 11 grade threes went to the museum on the school bus. How many children were on the bus?

The bus route the class took to the park is 8 km. The bus route the class took from the park back to the school is 7 km. How far did the class travel?

Invite the children to draw a picture to help them solve each problem. Examine and discuss some of the pictures.

2

Reverse the activity described in activity 1. Draw pictures on the easel; for example, two clocks showing different times, bus routes, children engaged in various activities, and so on.

Invite the children to make up and state problems to go with each picture. Then have volunteers draw pictures on the easel. Have other children state a problem to go with each picture, and use the easel to solve the problem.

Written and Other Activities

☐

mathways 3, page 268

Have children read aloud and paraphrase three of the problems. Discuss with the children possible pictures for showing the information in the problems. Assign the questions, reminding the children that it may not be necessary to draw a picture to help find the answer for every problem.

☐ ☐

Have the children cut pictures from catalogues and newspapers and paste the pictures on cards. Instruct the children to leave enough room at the bottom of the card to write a problem. Have these picture-problem cards placed in the activity centre for children to work on in their spare time.

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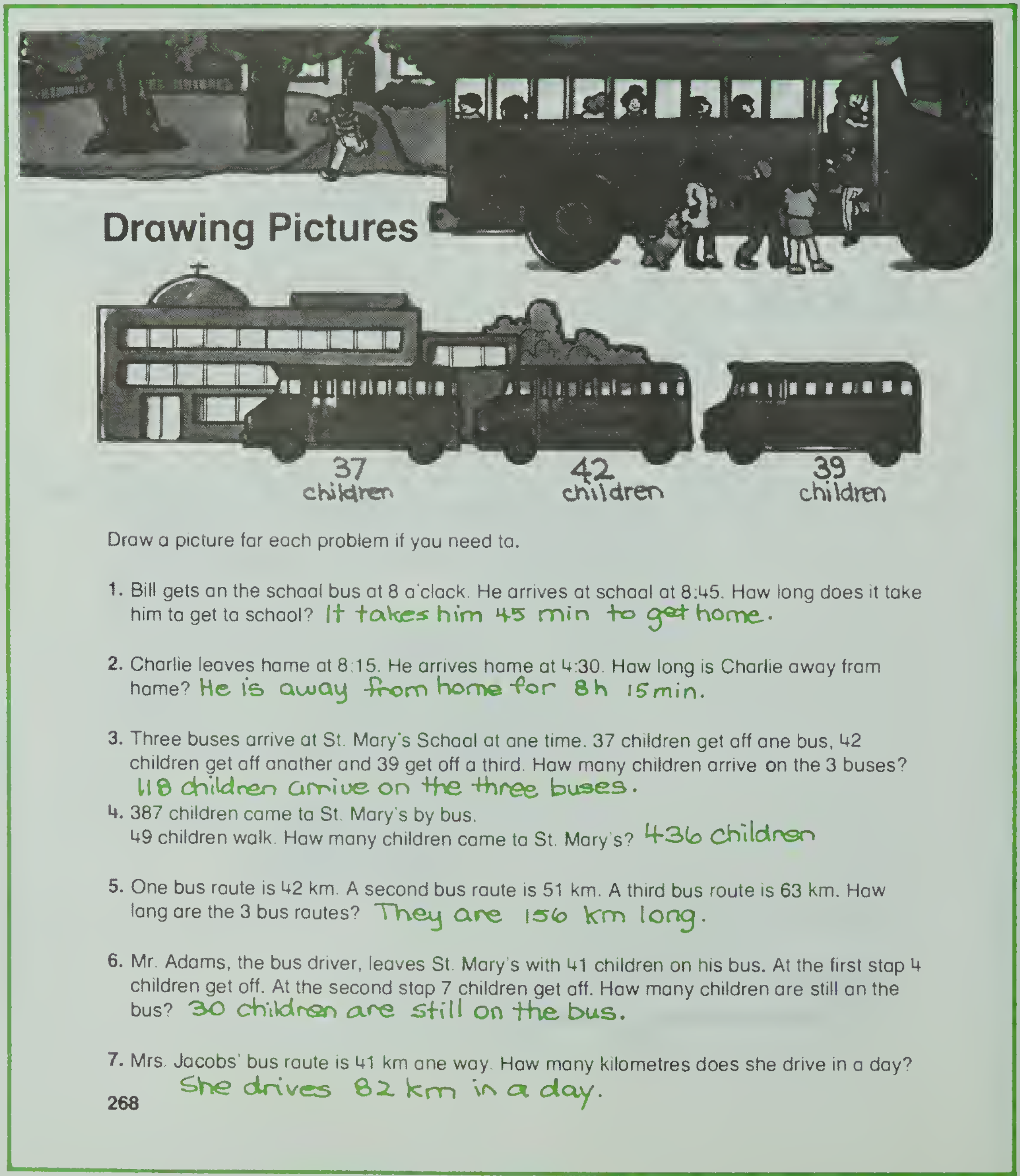
For an art lesson, have the children draw pictures that could be used for word problems. Display the pictures, and have each child write and solve a problem to go with one of the pictures.



Drawing Pictures

37 children

42 children

39 children

Draw a picture for each problem if you need to.

1. Bill gets on the school bus at 8 o'clock. He arrives at school at 8:45. How long does it take him to get to school? It takes him 45 min to get home.
2. Charlie leaves home at 8:15. He arrives home at 4:30. How long is Charlie away from home? He is away from home for 8h 15min.
3. Three buses arrive at St. Mary's School at one time. 37 children get off one bus, 42 children get off another and 39 get off a third. How many children arrive on the 3 buses? 118 children arrive on the three buses.
4. 387 children came to St. Mary's by bus. 49 children walk. How many children came to St. Mary's? 436 children
5. One bus route is 42 km. A second bus route is 51 km. A third bus route is 63 km. How long are the 3 bus routes? They are 156 km long.
6. Mr. Adams, the bus driver, leaves St. Mary's with 41 children on his bus. At the first stop 4 children get off. At the second stop 7 children get off. How many children are still on the bus? 30 children are still on the bus.
7. Mrs. Jacobs' bus route is 41 km one way. How many kilometres does she drive in a day? She drives 82 km in a day.

268

Unit 3 Section 13 Lesson 4

Solving Word Problems With Multiplication and Division

PROBLEM SOLVING

Materials

- pictures of vehicles with various numbers of wheels, such as bicycles, trucks, cars, tricycles

Lesson

1

Seat the children around the working area. Display a picture of a vehicle. Have a child count the number of wheels. Ask a multiplication question such as
How many wheels would five of these have?
Ask whether they used addition, subtraction, multiplication or division to find the answer. Then ask a division question such as
If there were 24 wheels, how many of these cars would there be?
Have a child state the operation used to find the answer. Discuss the difference between multiplication problems and division problems.
Show different pictures, asking multiplication and division questions for the children to answer and state the operation used.

2

Tell each child to draw a picture of three vehicles with the same number of wheels. Have each artist write and solve a multiplication and a division problem for her or his picture.

3

Each child can draw a picture of a vehicle with an unusual number of wheels. Divide the class into groups of three or four. The children in a group put their pictures together. The children in a group take turns pointing to a picture and asking a multiplication or a division question about the wheels for the others to answer orally.

Written and Other Activities

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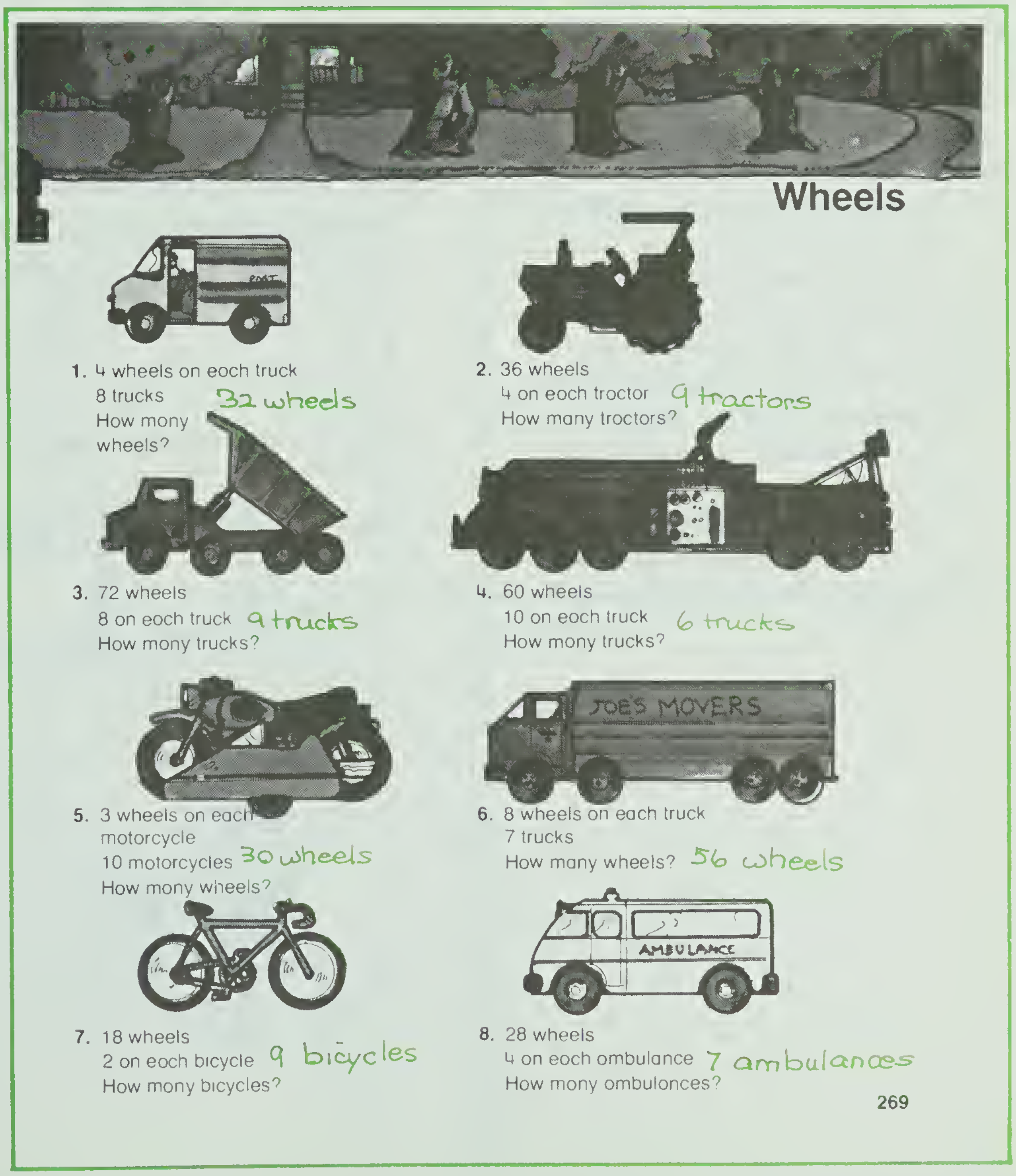
mathways 3, page 269

Compare the pictures with those used during the lesson. Assign the problems and remind the children that pictures can be drawn to help solve any problem. Some children may benefit from drawing pictures for a few of these problems.



Wheels

1. 4 wheels on each truck
8 trucks 32 wheels
How many wheels?

2. 36 wheels
4 on each tractor 9 tractors
How many tractors?

3. 72 wheels
8 on each truck 9 trucks
How many trucks?

4. 60 wheels
10 on each truck 6 trucks
How many trucks?

5. 3 wheels on each motorcycle
10 motorcycles 30 wheels
How many wheels?

6. 8 wheels on each truck
7 trucks
How many wheels? 56 wheels

7. 18 wheels
2 on each bicycle 9 bicycles
How many bicycles?

8. 28 wheels
4 on each ambulance 7 ambulances
How many ambulances?

269

Unit 3 Section 13 Lesson 5

Solving Word Problems: Maps, Distances in Kilometres, Amounts of Money

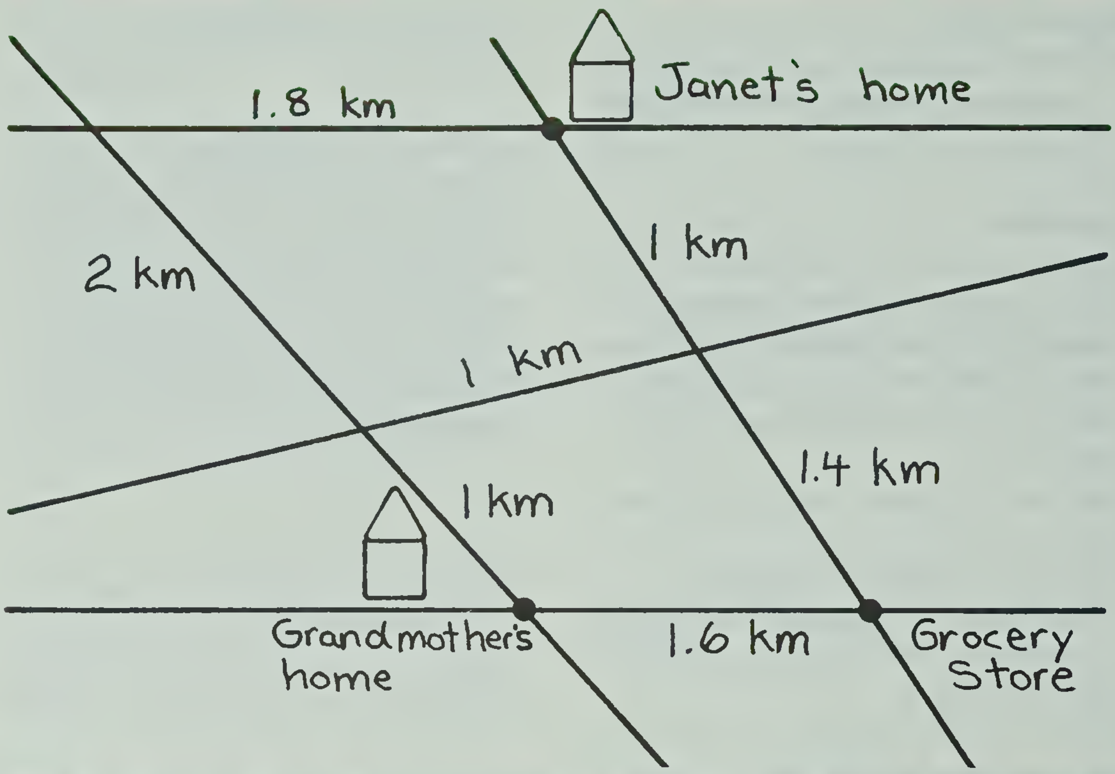
Materials

- Bristol board
- markers

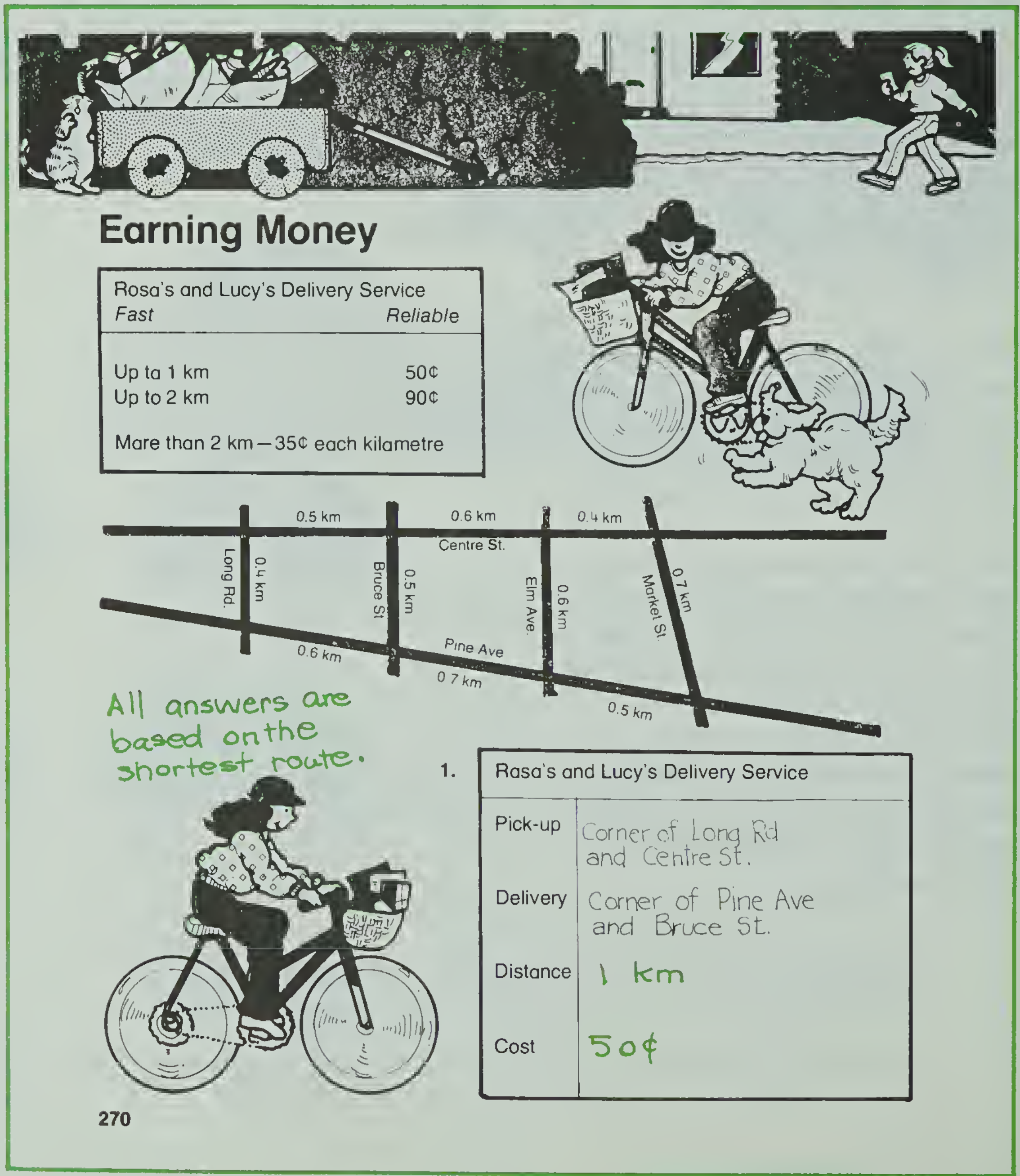
Lesson

1

Gather the children around the working area. Begin a discussion of delivery services, asking children to tell about delivery trucks they have seen in their neighbourhoods or that have been to their homes. Perhaps the children are familiar with deliveries from furniture stores, department stores, restaurants, parcel post and so on. Discuss the cost of deliveries, explaining that frequently such costs are based on the distance from the pick up to the delivery point. Some children may have taken trips in taxi cabs, trains, airplanes and so on. Ask these children why it costs more to go to some places than to other places. Draw a map on the easel, marking on the map several different points and the distances between these points.


1.8 km
Janet's home
1 km
2 km
1 km
1.4 km
1 km
Grandmother's home
1.6 km
Grocery Store

Pose problems such as the following: *Janet wants to take a taxi from her house to her grandmother's house. How far is it between the two houses? If the taxi driver charges 90¢ a kilometre, how much money will Janet have to pay?*
Have volunteers solve the problems. Write the answer to each problem in a full sentence so that the children will see a model.



Earning Money

Rosa's and Lucy's Delivery Service *Fast* *Reliable*	
Up to 1 km	50¢
Up to 2 km	90¢
More than 2 km — 35¢ each kilometre	

0.5 km
0.6 km
0.4 km
Centre St.
Long Rd.
0.4 km
Bruce St
0.5 km
Elm Ave
0.6 km
Market St.
0.7 km
Pine Ave
0.6 km
0.7 km
0.5 km

All answers are based on the shortest route.

1.

Rosa's and Lucy's Delivery Service	
Pick-up	Corner of Long Rd and Centre St.
Delivery	Corner of Pine Ave and Bruce St.
Distance	1 km
Cost	50¢

270

Written and Other Activities

☐

mathways 3, pages 270, 271

Have the children trace various routes on the map with their fingers. Refer to the price list at the top of the page, and discuss the cost of delivery. For the first problem, have each child point to the pick up and delivery point on the map, and describe the route he or she would take. Ask the children how they would find the distance between the two points, and how they would find the cost of delivery. Assign the problems.

☐ ☐

Have the children use the map and the price list on *mathways 3,* page 270 to make up problems. Each child could write a problem on a sheet of paper. The children can then exchange papers and solve the problems.

☐ ☐ ☐

Have pairs of children draw and label a map of their neighbourhood, following the model on page 270. Have them make up a price list and write problems, then solve the problems.

Ask each child to draw a map similar to the map on page 270 in *mathways 3* and to mark distances on the map. Discuss the fact that the map distances should be in proportion. Have the children pretend that they are offering a dog walking service. Have them draw posters which they might put up in supermarkets to advertise their services, and design brochures which they might want to hand deliver to homes. They might want to include in the brochure information such as price structure, times when their services are available, whether or not the dogs must be friendly and so on. Have them also design a bill format based on the ones found on pages 270 and 271 of *mathways 3.*

☐ ☐ ☐ ☐ ☐

Ask the children who have paper routes to draw large maps showing the houses to which they deliver papers. Give these children an opportunity to show their maps, to show the routes they follow and to tell about the business aspects of their paper delivery service. Give the observers opportunities to ask questions of the presenters. Should there not be a child with a paper route in the class, ask for older brother or sister volunteers to perform the tasks described.

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mathways 3 Tests 4A, 4B

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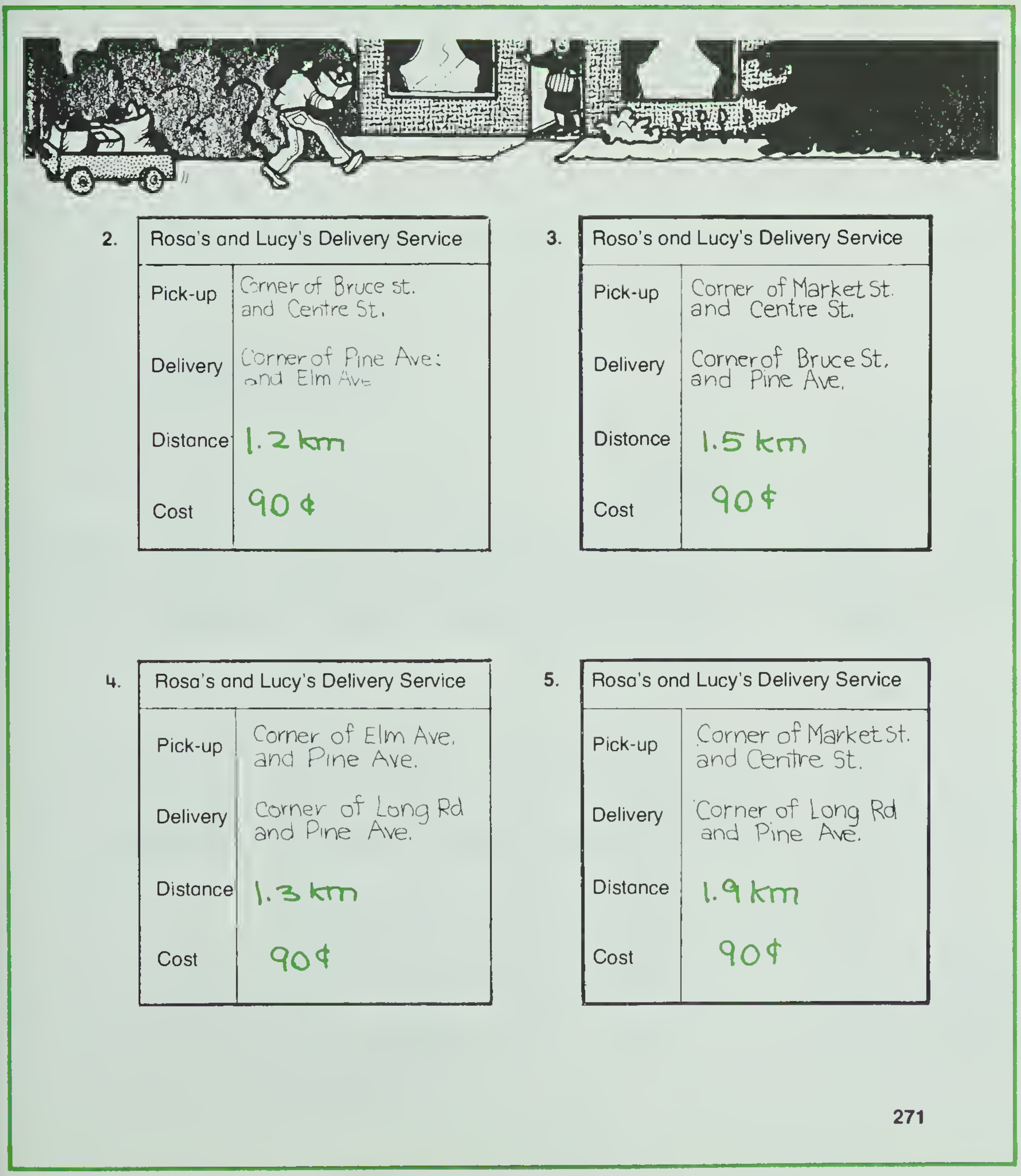
mathways 3 Plus Workbook pages 91 and 92



2.

	Rosa's and Lucy's Delivery Service
Pick-up	Corner of Bruce St. and Centre St.
Delivery	Corner of Pine Ave. and Elm Ave.
Distance	1.2 km
Cost	90 ¢

3.

	Rosa's and Lucy's Delivery Service
Pick-up	Corner of Market St. and Centre St.
Delivery	Corner of Bruce St. and Pine Ave.
Distance	1.5 km
Cost	90 ¢

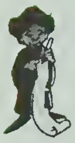
4.

	Rosa's and Lucy's Delivery Service
Pick-up	Corner of Elm Ave. and Pine Ave.
Delivery	Corner of Long Rd and Pine Ave.
Distance	1.3 km
Cost	90 ¢

5.

	Rosa's and Lucy's Delivery Service
Pick-up	Corner of Market St. and Centre St.
Delivery	Corner of Long Rd and Pine Ave.
Distance	1.9 km
Cost	90 ¢

271

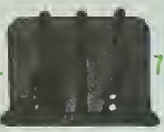


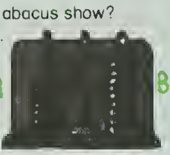
Unit 3, Check 1

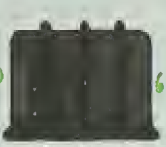
Write the numeral

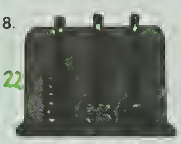
1. 2 hundreds 0 tens and 5 205
2. 8 hundreds 1 ten and 1 811
3. 6 hundreds 0 tens and 0 600
4. 5 hundreds 2 tens and 9 529

What number does each abacus show?

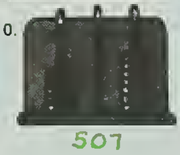
5 402


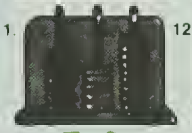
6. 719


7. 800


8. 622


9 300

10. 507


11. 759


12. 603

Add.

13. 37	14. 49	15. 76	16. 48	17. 57	18. 64	19. 87	20. 18
+ 46	+ 38	+ 19	+ 36	+ 25	+ 29	+ 9	+ 62
83	87	95	84	82	93	96	80
17. 429	22. 362	23. 147	24. 757	25. 626	26. 171	27. 209	28. 574
+ 135	+ 328	+ 316	+ 238	+ 148	+ 819	+ 483	+ 217
564	690	463	995	774	990	692	791

Subtract.

29. 63	30. 57	31. 86	32. 92	33. 76	34. 32	35. 73	36. 90
− 27	39	− 27	− 77	− 48	18	− 26	− 35
36	18	59	15	28	14	47	55

Subtract.

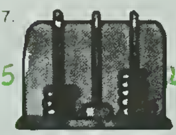
37. 833	38. 952	39. 547	40. 763	41. 872	42. 884	43. 572	44. 931
214	− 628	129	525	− 346	136	− 316	− 514
619	324	418	238	526	748	256	417

Unit 3, Practice 1

Write the numeral.

1. 700 + 40 + 2 742
2. 500 + 80 + 3 583
3. 800 + 70 + 0 870
4. 600 + 10 + 9 619
5. 600 + 90 + 1 691
6. 400 + 20 + 9 429

What number does each abacus show?

7. 315


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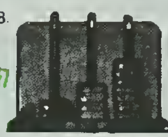

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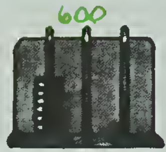
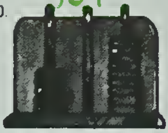
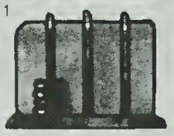
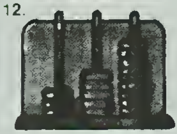
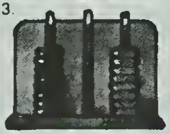
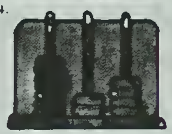


10. 509


11 400


12. 359


13. 808


14. 724


Add.

15. 36	16. 79	17. 53	18. 15	19. 79	20. 98	21. 47	22. 29
+ 47	+ 16	+ 29	+ 38	+ 14	+ 36	+ 38	+ 47
83	95	82	53	93	134	85	76
23. 354	24. 403	25. 622	26. 776	27. 375	28. 186	29. 273	30. 581
+ 128	+ 327	+ 109	+ 115	+ 118	+ 506	+ 119	+ 309
482	730	731	891	493	692	392	890

Subtract

31. 47	32. 84	33. 45	34. 36	35. 62	36. 78	37. 93	38. 54
39	− 17	18	− 19	15	− 39	87	− 18
8	67	27	17	47	39	6	36
39. 432	40. 781	41. 524	42. 865	43. 374	44. 283	45. 452	46. 324
− 109	215	− 107	119	− 128	119	− 237	106
323	566	417	746	246	164	215	218

Unit 3, Check 2

Write the numeral.

1. 13 tenths 1.3
2. 46 tenths 4.6
3. 14 tenths 1.4
4. 28 tenths 2.8
5. 18 tenths 1.8
6. 12 tenths 1.2
7. 37 tenths 3.7
8. 19 tenths 1.9
9. 15 tenths 1.5
10. 11 tenths 1.1
11. 39 tenths 3.9
12. 62 tenths 6.2

Write the meaning

13. 1.7 17 tenths
14. 3 1 31 tenths
15. 3 6 36 tenths
16. 5 1 51 tenths
17. 6.7 67 tenths
18. 6 8 68 tenths
19. 4 5 45 tenths
20. 2 8 28 tenths
21. 4.4 44 tenths
22. 2.1 21 tenths
23. 8 5 85 tenths
24. 4.3 43 tenths
25. 7.5 75 tenths
26. 6.0 60 tenths
27. 7.3 73 tenths

Add Use the number line.

28. 0.6	29. 0.4	30. 0.8	31. 0.2	32. 0.5	33. 0 3
+ 0.7	+ 0 9	+ 0.5	+ 0.9	+ 0 7	+ 0.8
1.3	1.3	1.3	1.1	1.2	1.1
34. 0.6	35. 1 1	36. 0.6	37. 0 9	38. 1 6	39. 1.5
+ 0.8	+ 0.4	+ 1.2	+ 0 7	+ 0.5	+ 0.3
1.4	15	1.8	1.6	2.1	1.8

Subtract Use the number line

40. 1 1	41. 0 9	42. 1 8	43. 1 2	44. 0.7	45. 1.3
0 7	0 2	0.5	0.8	0.5	0.6
0.4	0.7	1.3	0.4	0.2	0.7
46. 1.4	47. 0.8	48. 1.6	49. 1.9	50. 1 5	51. 1.7
0.8	− 0.1	− 0.7	0.8	0 3	− 0.9
0.6	0.7	0.9	1.1	1.2	0.8

Unit 3, Practice 2

Write the numeral.

1. 21 tenths 2.1
2. 11 tenths 1.1
3. 19 tenths 1.9
4. 62 tenths 6.2
5. 18 tenths 1.8
6. 10 tenths 1.0
7. 37 tenths 3.7
8. 54 tenths 5.4
9. 24 tenths 2.4
10. 16 tenths 1.6
11. 63 tenths 6.3
12. 15 tenths 1.5

Write the meaning

13. 1 1 11 tenths
14. 3.7 37 tenths
15. 5 6 56 tenths
16. 8.4 84 tenths
17. 6.9 69 tenths
18. 2.3 23 tenths
19. 7 6 76 tenths
20. 4.8 48 tenths
21. 2 9 29 tenths
22. 4 0 40 tenths
23. 6 3 63 tenths
24. 1 4 14 tenths
25. 5.2 52 tenths
26. 3 5 35 tenths
27. 8 8 88 tenths

Add. Use the number line.

28. 0.7	29. 1.2	30. 0.8	31. 0 4	32. 1.3	33. 1 8
+ 0.6	+ 0.5	+ 0.5	+ 0.9	+ 0.1	+ 0.1
1.3	1.7	1.3	1.3	1.4	1.9
34. 1 1	35. 0.8	36. 0 5	37. 0 9	38. 0.6	39. 0.2
+ 0 2	+ 0.8	+ 0.7	+ 0.8	+ 0.6	+ 1 1
1.3	1.6	1.2	1.7	1.2	1.3

Subtract. Use the number line

40. 1 2	41. 0.9	42. 0.7	43. 1.4	44. 1.7	45. 1.5
− 0 9	0.6	0.4	1.1	− 1.6	− 0.3
0.3	0.3	0.3	0.3	0.1	1.2
46. 0.8	47. 1.3	48. 1.7	49. 1.5	50. 1.8	51. 2.1
− 0.3	− 0.7	0 1	0 2	− 0.1	− 0.1
0.5	0.6	1.6	1.3	1.7	2.0

Unit 3, Check 3

Add.

1.	2.	3.	4.	5.
0.4	0.6	0.3	0.8	0.2
+ 0.5	+0.2	+0.5	+0.1	+0.7
0.9	0.8	0.8	0.9	0.9

Subtract.

6.	7.	8.	9.	10.
0.6	0.8	0.7	0.9	0.5
− 0.5	− 0.4	− 0.2	− 0.5	− 0.3
0.1	0.4	0.5	0.4	0.2

Add.

11.	12.	13.	14.	15.
3.6	5.8	7.9	6.1	2.9
+ 4.7	+ 2.3	+ 1.6	+ 4.8	+ 1.5
8.3	8.1	9.5	10.9	4.4

Subtract

16.	17.	18.	19.	20.
9.6	3.2	4.3	3.5	4.2
− 3.7	− 1.7	− 2.9	− 1.6	− 1.8
5.9	1.5	1.4	1.9	2.4

Multiply.

21. (5, 5) 25	22. (6, 8) 48	23. (6, 7) 42	24. (9, 6) 54	25. (8, 5) 40
26. (9, 9) 81	27. (9, 8) 72	28. (5, 7) 35	29. (8, 8) 64	30. (9, 7) 63
31. (7, 8) 56	32. (7, 5) 35	33. (9, 5) 45	34. (4, 5) 20	35. (6, 9) 54
36. (6, 0) 0	37. (8, 1) 8	38. (8, 3) 24	39. (7, 0) 0	40. (5, 4) 20

Divide.

41. 12 ÷ 4 3	42. 72 ÷ 9 8	43. 24 ÷ 8 3	44. 25 ÷ 5 5	45. 35 ÷ 7 5
46. 45 ÷ 9 5	47. 20 ÷ 5 4	48. 64 ÷ 8 8	49. 49 ÷ 7 7	50. 63 ÷ 7 9
51. 48 ÷ 6 8	52. 81 ÷ 9 9	53. 20 ÷ 4 5	54. 32 ÷ 8 4	55. 54 ÷ 6 9
56. 40 ÷ 8 5	57. 27 ÷ 3 9	58. 24 ÷ 6 4	59. 20 ÷ 4 5	60. 27 ÷ 9 3

Unit 3, Practice 3

Add.

1.	2.	3.	4.	5.
0.8	0.9	0.6	0.7	0.8
+ 0.5	+ 0.3	+ 0.5	+ 0.7	+ 0.7
1.3	1.2	1.1	1.4	1.5

Subtract.

6.	7.	8.	9.	10.
1.5	3.6	4.4	3.2	1.7
− 0.6	− 0.8	− 0.7	− 0.5	− 0.9
0.9	2.8	3.7	2.7	0.8

Add.

11.	12.	13.	14.	15.
6.4	3.5	2.7	1.8	7.5
+ 2.7	+ 3.8	+ 4.7	+ 6.9	+ 1.6
9.1	7.3	7.4	8.7	9.1

Subtract.

16.	17.	18.	19.	20.
6.4	4.2	4.7	5.8	9.3
− 3.8	− 2.6	− 2.9	− 1.9	− 8.4
2.6	1.6	1.8	3.9	0.9

Multiply.

21. (9, 0) 0	22. (4, 6) 24	23. (6, 8) 48	24. (7, 9) 63	25. (8, 1) 8
26. (6, 0) 0	27. (9, 4) 36	28. (7, 1) 7	29. (7, 8) 56	30. (7, 4) 28
31. (4, 0) 0	32. (9, 8) 72	33. (8, 4) 32	34. (7, 6) 42	35. (9, 1) 9
36. (6, 4) 24	37. (7, 2) 14	38. (9, 5) 45	39. (8, 3) 24	40. (7, 4) 28

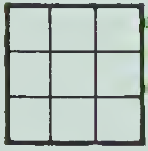
Divide.

41. 7 ÷ 7 1	42. 48 ÷ 8 6	43. 35 ÷ 7 5	44. 28 ÷ 7 4	45. 72 ÷ 8 9
46. 8 ÷ 1 8	47. 36 ÷ 9 4	48. 54 ÷ 9 6	49. 6 ÷ 1 6	50. 63 ÷ 7 9
51. 9 ÷ 9 1	52. 42 ÷ 7 6	53. 32 ÷ 8 4	54. 56 ÷ 7 8	55. 42 ÷ 6 7
56. 28 ÷ 4 7	57. 63 ÷ 9 7	58. 63 ÷ 7 9	59. 35 ÷ 5 7	60. 40 ÷ 8 5

Unit 3, Check 4

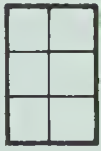
For each figure, find
a) the perimeter
b) the area
c) the volume of the cube or rectangular prism built on it

1. 3 Layers



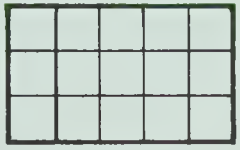
a) 12 cm
b) 9 cm^2
c) 27 cm^3

2. 4 Layers



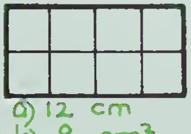
a) 10 cm
b) 6 cm^2
c) 24 cm^3

3. 2 Layers



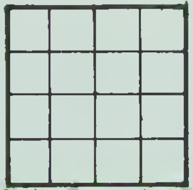
a) 16 cm
b) 15 cm^2
c) 30 cm^3

4. 4 Layers



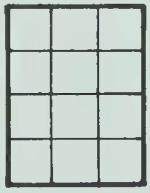
a) 12 cm
b) 8 cm^2
c) 32 cm^3

5. 3 Layers



a) 16 cm
b) 16 cm^2
c) 48 cm^3

6. 2 Layers



a) 14 cm
b) 12 cm^2
c) 24 cm^3

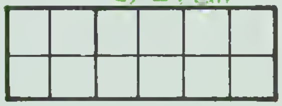
What units would you use to measure these? Answers may vary
7. your mass kilograms
8. your height Centimetres
9. the amount of milk you drink in a week litres
10. the shampoo you use to wash your hair millilitres
11. the distance you travel to school kilometres
12. today s temperature degrees Celsius

Unit 3, Practice 4

For each shape find:
a) the perimeter
b) the area
c) the volume of the cube or rectangular prism built on it

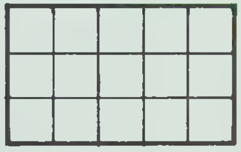
1. 2 Layers

a) 16 cm
b) 12 cm^2
c) 24 cm^3



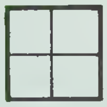
2. 2 Layers

a) 16 cm
b) 15 cm^2
c) 30 cm^3



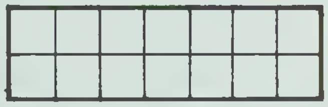
3. 4 Layers

a) 8 cm
b) 4 cm^2
c) 16 cm^3

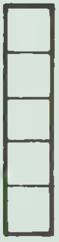


4. 3 Layers

a) 18 cm
b) 14 cm^2
c) 42 cm^3

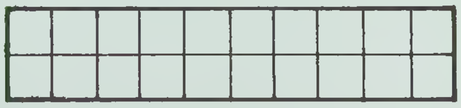


5. 3 Layers



a) 12 cm
b) 5 cm^2
c) 15 cm^3

6. 2 Layers



a) 24 cm
b) 20 cm^2
c) 40 cm^3

What units would you use to measure these? Answers will vary
7. the distance to the airport Kilometres
8. the juice in an orange millilitres
9. the length of your shoe centimetres
10. the mass of an apple grams
11. the width of a stamp millilitres
12. the width of your room metres

For Your Notes

For Your Notes

For Your Notes

Program Masters

Teaching Notes
Unit 4

Mathematics
Dictionary

Contents

See the *Unit at a Glance* for a detailed description of the objectives in each section.

Section	***mathways 3*** **Pages**	**Teaching Notes Pages**
1	281–285	316–321
2	286–292	322–330
3	293–299	331–337
4	300–305	338–345
5	306–313	346–357
6	314–334	358–371

Unit 4 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 1						
1	**281**	**316, 317**	Exploring thousands		• beans • jars • place-value materials for representing thousands, hundreds, tens and ones • place-value mats • construction paper • chart paper • abaci • numeral cards for 0 to 9 • Program Masters 19, 20, 28	1000-cube thousands
2	**282**	**318**	Exploring thousands: writing numerals to 9000			
3	**283**	**319**	Exploring thousands			
4	**284, 285**	**320, 321**	Exploring thousands: the place-value meaning of four-digit numbers to 9999			
Section 2						
1	**286**	**322, 323**	Writing the meaning, the expanded numeral and the standard numeral for four-digit numbers		• place-value materials • place-value mats • abaci • lightweight cardboard • for groups of four children: 63 game cards — 15 for each of the numerals 1, 10, 100, 1000, and three cards marked STOP! • stencil, TN pages 323, 328 • Program Master 23	meaning expanded numeral year date A.D. rule series similar/similarity
2	**287, 288**	**324, 325**	Using an abacus to represent four-digit numbers; writing meanings and expanded numerals			
3	**289**	**326**	Writing the year			
4	**290**	**327, 328**	Ordering four-digit numbers: the numbers before, after and between			
5	**291**	**329**	Ordering four-digit numbers: greatest to least, least to greatest			
6	**292**	**330**	Completing number patterns			

Unit 4 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 3						
1	**293, 294**	**331, 332**	Exploring decimals: hundredths		• nine fractional pies, each one coloured to show a decimal from 0.1 to 0.9 • 30 cm by 3 cm rectangle divided into tenths • rectangle divided into two rows of five squares • eight squares divided into hundredths and coloured to show decimals 0.01, 0.05, 0.10, 0.17, 0.30, 0.54, 0.83, 0.98 • 10 cm by 10 cm squares of 1 cm graph paper • die marked 0.05, 0.08, 0.11, 0.02, 0.15, 0.20 • rulers marked in centimetres and millimetres • metre sticks marked in centimetres and millimetres • Program Master 5	hundredth zero decimal one zero decimal two zero decimal three . . . zero decimal ninety-nine millimetre
2	**295, 296**	**333, 334**	Relating decimals to centimetres and metres			
3	**297, 298**	**335, 336**	Exploring millimetres			
4	**299**	**337**	Solving word problems: millimetres			
Section 4						
1	**300, 301**	**338, 339**	Exploring slides		• magazines and catalogues • samples of wallpaper or wrapping paper • tracing paper • price tags • rectangular pieces of Bristol board • stencil, TN pages 339, 341, 343 • Program Masters 34, 14 – 18	slide position horizontal vertical diagonal slide arrow flip flip line reduced/reduction original price on sale sale price
2	**302, 303**	**340, 341**	Flipping pictures and shapes			
3	**304**	**342, 343**	Solving word problems: adding and subtracting amounts of money			
4	**305**	**344, 345**	Making change			

Unit 4 at a Glance

Lesson	mathways 3 Pages	Teaching Notes Pages	Objectives	mathways 3 Supplementary Items	Materials	Vocabulary
Section 5						
1	**306**	**346, 347**	Multiplying by 10		• dimes • one dollar bill • abacus • rulers marked in centimetres and millimetres • activity cards, TN page 350 • place-value materials • place-value mats • metre sticks marked in centimetres • 100 pennies • stencil, TN page 348 • Program Masters 19, 20	partial product final product
2	**307**	**348**	Multiplying by 10: converting centimetres to millimetres			
3	**308**	**349, 350**	Multiplying by multiples of 10			
4	**309**	**351, 352**	Multiplying a two-digit number: expanded numerals			
5	**310**	**353, 354**	Multiplying a two-digit number by a one-digit number			
6	**311**	**355**	Multiplying a two-digit number			
7	**312**	**356**	Multiplying by 100: converting metres to centimetres			
8	**313**	**357**	Multiplying by 100: converting dollars to cents			
Section 6						
1	**314**	**358, 359**	Exploring division: recalling facts to 81 ÷ 9, using the symbol $\overline{)}$		• counters • gameboard, TN page 361 • die • *Concentration* cards, TN page 361 • display-size calendar page for the current month • large calendar of current year • chart paper • old calendars • recent edition of *Quick Canadian Facts* (Toronto: Quick Canadian Facts Ltd.) • display-size calendar for June, July and August • seed catalogues • empty seed packages • stencil, TN page 363 • Program Masters 5, 2, 31	quotient dividend season month holiday yesterday today tomorrow calendar weekday journal leap year
2	**315**	**360, 361**	Recalling division facts			
3	**316**	**362, 363**	Illustrating word problems involving division			
4	**317, 318**	**364, 365**	Telling time: using a calendar			
5	**319, 320**	**366, 367**	Writing dates, solving word problems			
6	**321**	**368**	Solving word problems			
	323–334	**369–371**	Further Practice			

Unit 4 Section 1 Lesson 1

Exploring Thousands

Materials

- beans
- jars
- labels
- for each child
  - place-value materials for representing thousands, hundreds, tens and ones, reproduced from Program Masters 19 and 20

Rationale

Children need many opportunities to handle place-value materials to grasp the concepts involved in the base 10 system of numeration. A firm understanding of place value prepares the children to compare, order and regroup numbers, and to perform operations involving whole numbers and decimals.

By this point in the program, the children have already had a great deal of experience with materials representing ones, tens and hundreds. The concept of thousands, then, is a natural extension of the system of relationships they already know:

10 ones = 1 ten
10 tens = 1 hundred
10 hundreds = 1 thousand
10 ones = 1 ten
100 ones = 1 hundred
1000 ones = 1 thousand

Lesson

1

Gather the children around the working area and distribute the place-value materials. Have the children each take nine unit cubes.

How many ones are there?

Write *9* on the easel.

Add one more cube, please.

Have the children replace the 10 unit cubes with a 10-strip.

Write on the easel

10 ones
1 ten

Have each child in the group exchange 1 ten for 10 ones, and discuss the equivalence in value.

2

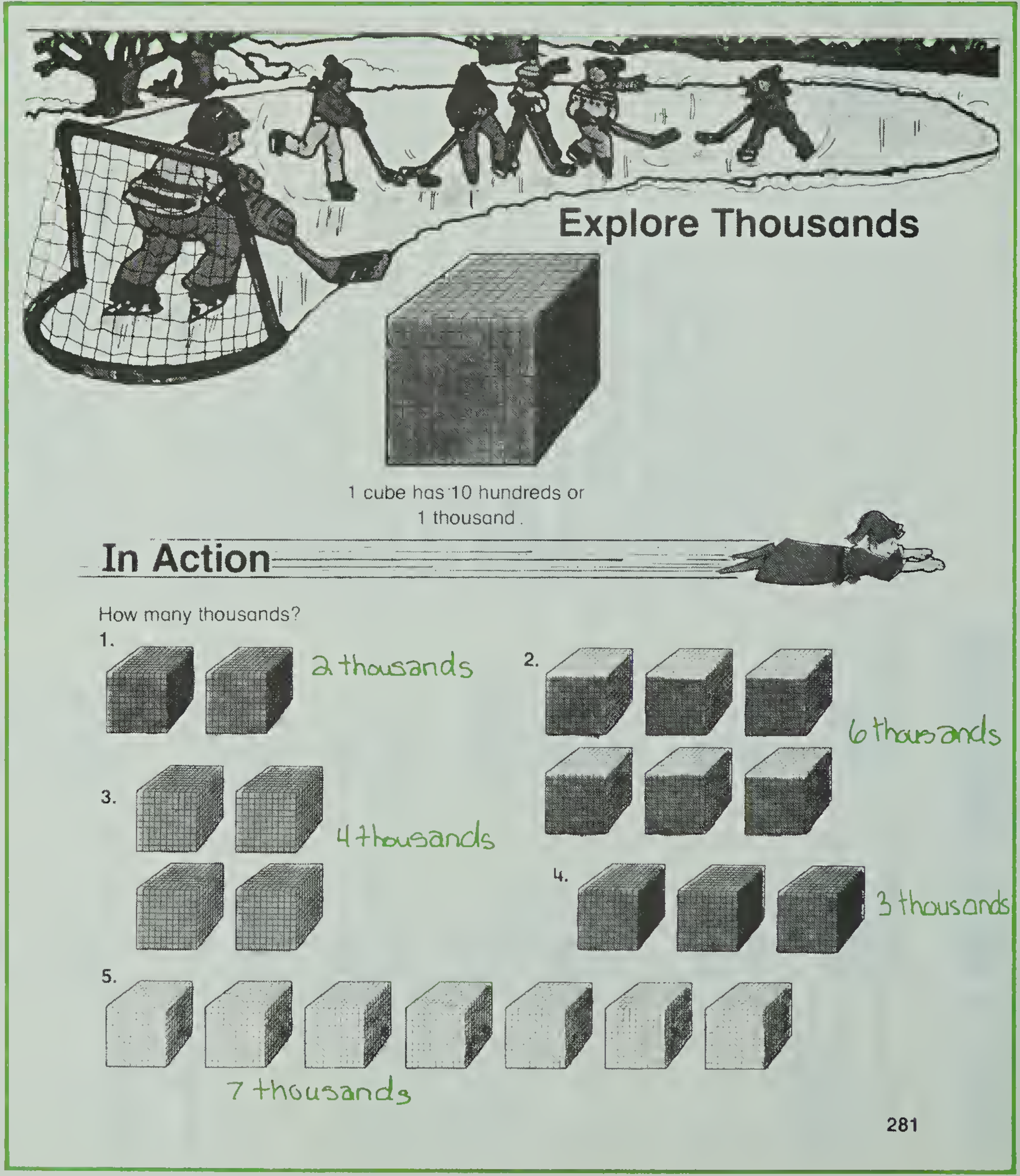
Have the children each take nine 10-strips and nine unit cubes and name the number represented. Write *99* on the easel. Have the children add one more unit cube and state the number represented. Then have them replace the 10-strips with one 100-flat. Write on the easel

9 tens 10 ones
10 tens
1 hundred

Discuss with the children that each expression is a way of representing the number 100.

3

Have the children each take nine 100-flats, nine 10-strips and nine unit cubes. Ask the children to name the number. Write *999* on the easel. Have the children add one cube to their materials and discuss the number that is one more than 999. Have the children replace 10 unit cubes with one 10-strip. Discuss the exchange, and that the number represented is still 1000. Have the children replace ten 10-strips with one 100-flat. Again discuss the equivalence in value. Have the children replace ten 100-flats with one 1000-cube. Explain that the cube represents the number 1000. Have a child write the numeral on the easel. Then write



Explore Thousands

1 cube has 10 hundreds or 1 thousand.

In Action

How many thousands?

1. 2 thousands
2. 6 thousands
3. 4 thousands
4. 3 thousands
5. 7 thousands

281

9 hundreds 9 tens 10 ones
9 hundreds 10 tens
10 hundreds
1 thousand

4

Have a child show three 1000-cubes. *How many thousands are there?* Record on the easel

3 thousands

Have another child show four 1000-cubes, ask for the number of thousands and record

4 thousands

Continue in this fashion to *9 thousands.*

5

State a number of thousands. Have a child show the number with 1000-cubes. Then have each child in the group take turns naming a number of thousands. If possible each time, all the children show the number with their materials.

Written and Other Activities

☐

mathways 3, page 281

Compare the 1000-cubes pictured to the materials used during the lesson. After discussion, assign the In Action questions.

☐ ☐

Divide the class into small groups and give each group place-value materials for representing numbers to 999. Each child in the group names a number of hundreds, tens and ones, and the other children show the number with their materials and record the numeral. Then the children discuss how many more flats, strips and units would be required to make 1000.

☐ ☐ ☐

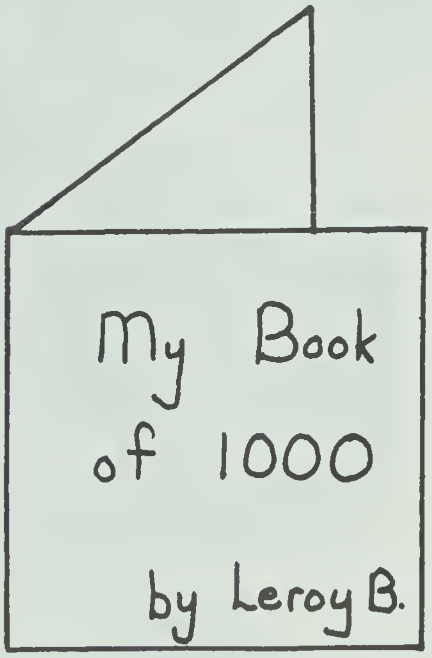
To help consolidate the concept of 1000, involve the children in some form of counting activity to represent 1000. They might, for example, count out 1000 beans and put them in a jar with the label *1000*. According to their interest the children might be paired so that each child is responsible for counting five sets of 100 beans, or they might work in groups of 10 with each counting one set of 100. If several jars each holding 1000 beans were assembled, they could be used to practise counting by thousands.

☐ ☐ ☐ ☐

Have the children count by ones to 10, by tens to 100, by hundreds to 1000, and by thousands to 9000. If they appear to be enjoying the activity, have them try counting backward by thousands, hundreds, tens and ones.

☐ ☐ ☐ ☐ ☐

Ask each of the children to think of a way of representing 1000. The activity could be assigned as homework and a number of days allowed for its completion. For example, a child might make a book of 1000 dots, consisting of 10 pages, each with a 10 by 10 array of 100 dots.



Another child might bring a box containing 1000 buttons. Still another child might collect 1000 bottle caps. If there seems to be enthusiasm for the idea, a short letter home might invite the family to become involved. Whatever the method, every child should be given plenty of opportunities to make progress reports and to tell her or his peers about the finished product.

For Your Notes

Unit 4 Section 1 Lesson 2

Exploring Thousands: Writing Numerals to 9000

Materials

- for each child
  - place-value materials and mats

Lesson

1

Seat the children around the working area and distribute place-value materials and place-value mats. Have the children show four unit cubes on their mats.

Ask a child to name the number represented. Write on the easel

4 ones

4

Have the children place six 10-strips in the tens column of their place-value mats. Ask the children to state the number of tens and the number represented. Write on the easel

6 tens

60

Have the children place eight 100-flats in the hundreds column of their mats. Ask them to state the number of hundreds and name the number represented. Record on the easel

8 hundreds

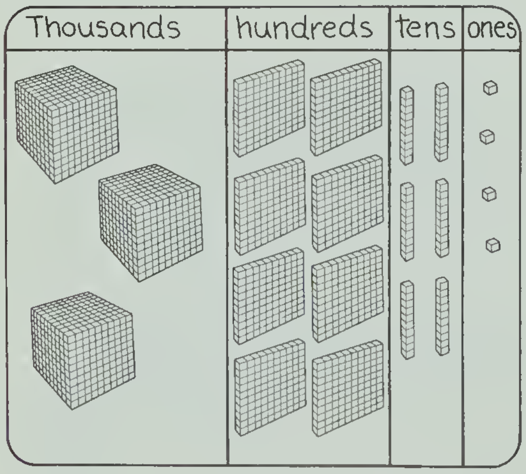
800

Have the children place three 1000-cubes in the thousands column of their mats.

Ask the children to state the number of thousands and name the number. Write on the easel

3 thousands

3000



Repeat this step until the children have represented thousands to 9000.

2

Write on the easel *5000*.

Ask the children to use 1000-cubes to show the number on their place-value mats. Repeat this step until the children have identified and represented numerals to 9000.

3

Discuss with the children real objects that could be collected and used to show 1000. A class list such as the following may be developed:

1000 buttons 1000 cubes 1000 beans 1000 grains of rice 1000 sheets of paper 1000 bottle caps

The children will probably think of many examples. Have the children transcribe the list onto a poster for display in the classroom.

Then delegate groups of children to bring in real-life examples for the next day's lesson. For example, one group of children could count out 1000 grains of barley; another group might bring in 1000 bottle caps solicited from stores in their neighbourhood; still another group might bring in books that have 1000 pages.

Written and Other Activities

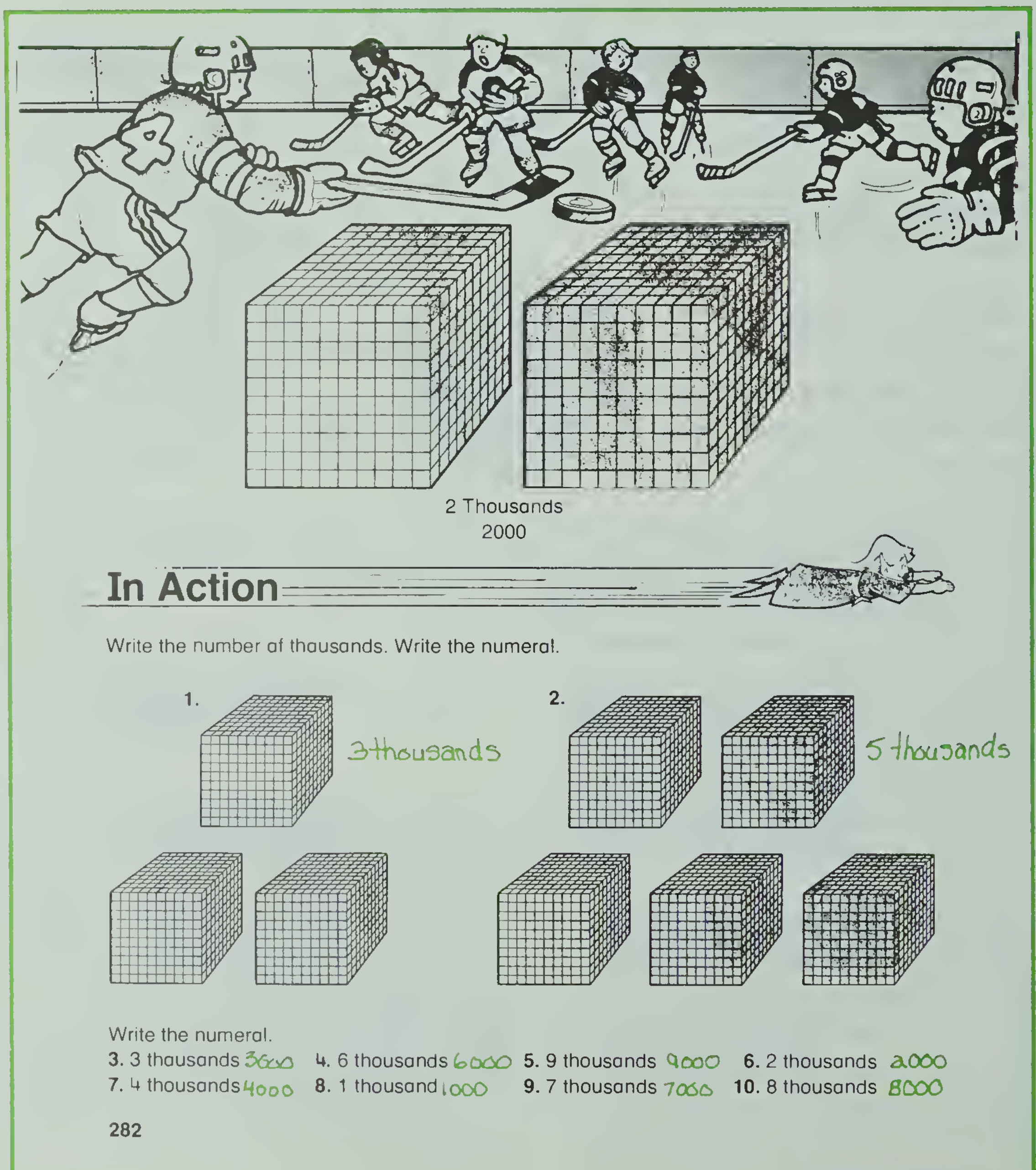
☐

mathways 3, page 282

Have the children use place-value materials to illustrate questions 3 to 10 on page 282.

☐ ☐

Have groups of children draw pictures to illustrate 1000. The children may wish to draw objects on the class list developed for activity 3 of the lesson.



2 Thousands
2000

In Action

Write the number of thousands. Write the numeral.

1. 3 thousands
2. 5 thousands

Write the numeral.

3. 3 thousands 3000
4. 6 thousands 6000
5. 9 thousands 9000
6. 2 thousands 2000
7. 4 thousands 4000
8. 1 thousand 1000
9. 7 thousands 7000
10. 8 thousands 8000

282

Unit 4 Section 1 Lesson 3

Exploring Thousands

Materials

- examples of 1000, prepared for Lesson 2, activity 6
- construction paper to make a 1000 Bulletin Board, *see* ☐ ☐ ☐
- chart paper

Lesson

1

Have the children place their collections of 1000 items in the activity centre. Then gather a group of children around the display and discuss the examples. The children can tell how many groups of ones, tens and hundreds there are in each collection, and describe their experiences in collecting and arranging or counting the objects. Did they count from one to 1000, or did they make 100 groups of 10? Did anyone make 10 groups of 100? Expand the discussion, asking the children what other objects in units of 1000 might look like and what collections of 2000 similar objects might be like.

2

To give the children some feeling for 1000, have each child make 1000 dots. The children can approach the task in several ways; for example, they might draw 10 columns and 10 rows of dots to make 10 square configurations of 100 dots, or they might make 10 random configurations of 100 dots and loop them, or they may loop 100 rows of 10 dots.

Written and Other Activities

☐

mathways 3, page 283

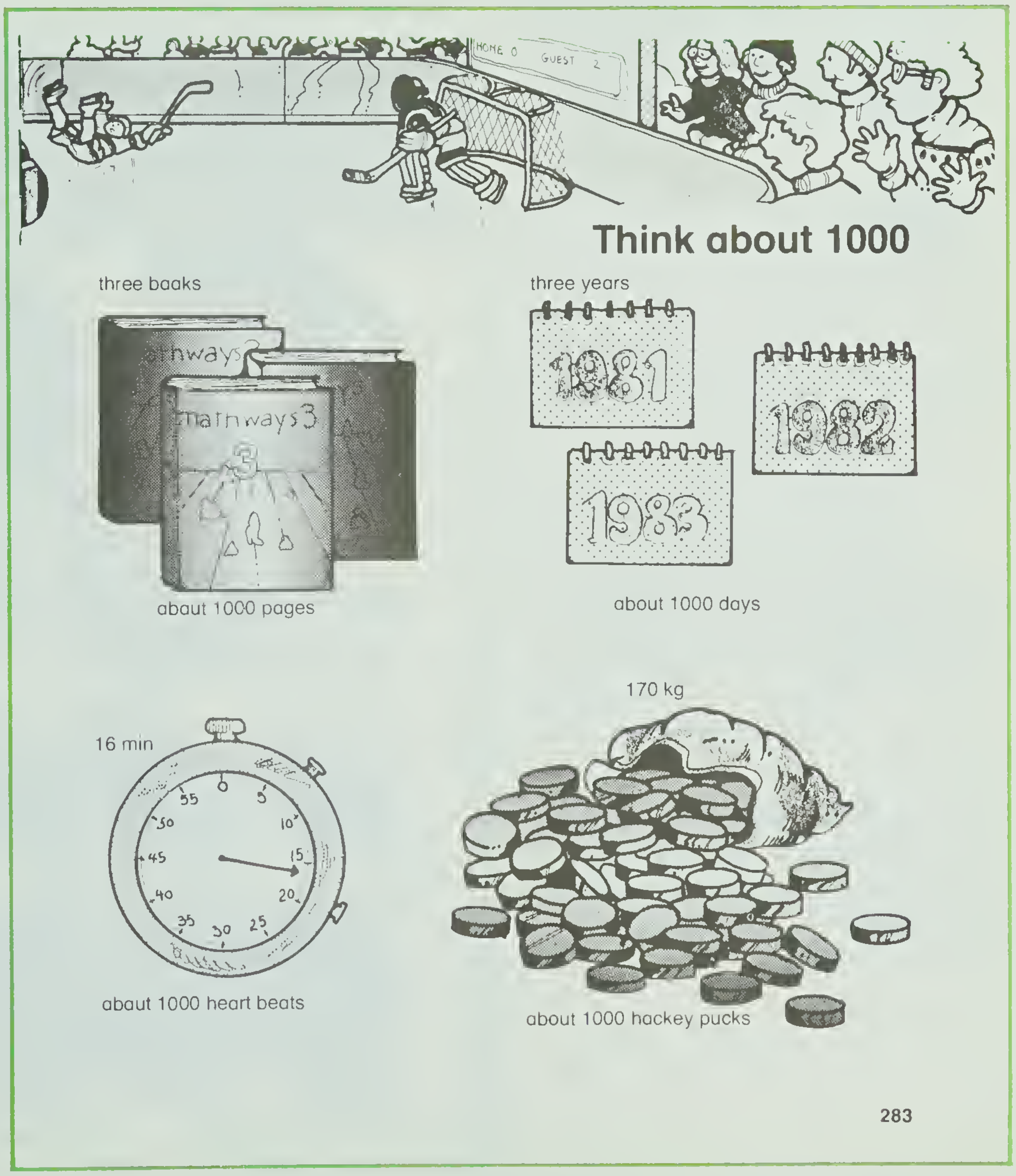
Discuss the examples shown on the page, and encourage the children to think of others. Tell them to listen to the sports reports on radio and television to find out how many thousands of people attended sports events and report these figures to the class. Have the children estimate how much space 1000 children would take up in the classroom.

☐ ☐

Tape a sheet of chart paper to the blackboard and label it *1000.* Throughout the day, have children write numerals in consecutive order until 1000 has been reached, each child taking up where the last child left off.

☐ ☐ ☐

The children may enjoy making a 1000 Bulletin Board. Divide the bulletin board into 10 equal sections. Then have the children cut construction paper into squares one-tenth the size of each section marked off on the board, to make 100 squares of paper. On each square, a child draws 10 tiny pictures and pins it to one section of the board. The children continue until each section contains 10 squares of construction paper. After the task has been completed, discuss the activity. Emphasize that there are 10 pictures on each square and 10 squares on each section, and 10 sections. Therefore there are 100 pictures in each of the 10 sections or 1000 pictures on the board.



Think about 1000

three books

about 1000 pages

three years

about 1000 days

16 min

about 1000 heart beats

170 kg

about 1000 hockey pucks

283

Unit 4 Section 1 Lesson 4

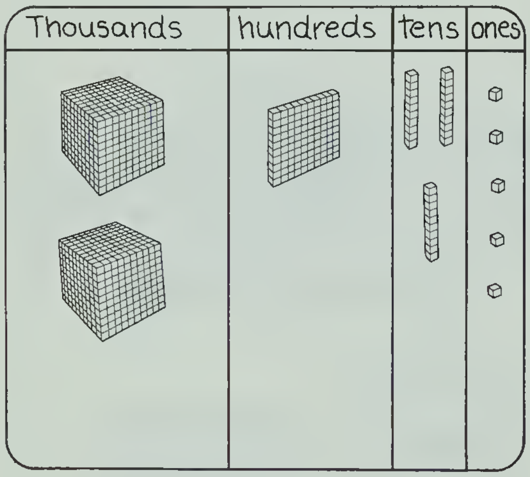
Exploring Thousands: The Place-Value Meaning of Four-Digit Numbers to 9999

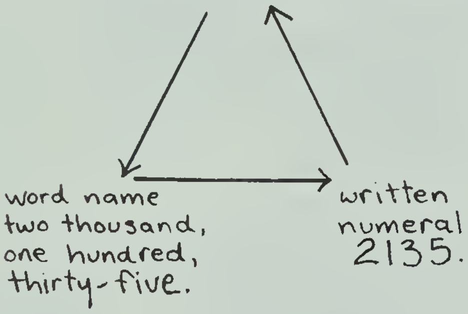
Materials

- for each child
  - place-value materials
  - place-value mat
  - abacus
  - sheet of abaci reproduced from Program Master 28
  - copy of stencil prepared with Program Master 28, *see* **5**
  - several blank cards
- for each group of four children
  - three numeral cards for each number from 0 to 9

Rationale

Given any one of three representations of a number, the children should be able to supply the other two.

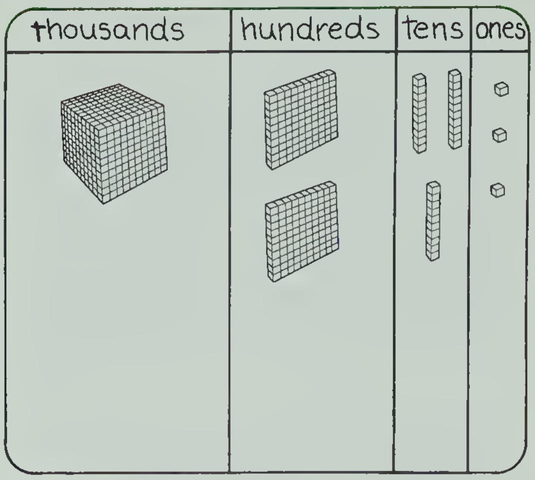




Lesson

1

Seat the children around the working area. Distribute the place-value materials and mats. Have the children use the materials to represent a four-digit number.



On the easel write the place-value meaning of the number and the numeral.

1 thousand 2 hundreds 3 tens and 3
1233

Say

One thousand, two hundred and thirty-three

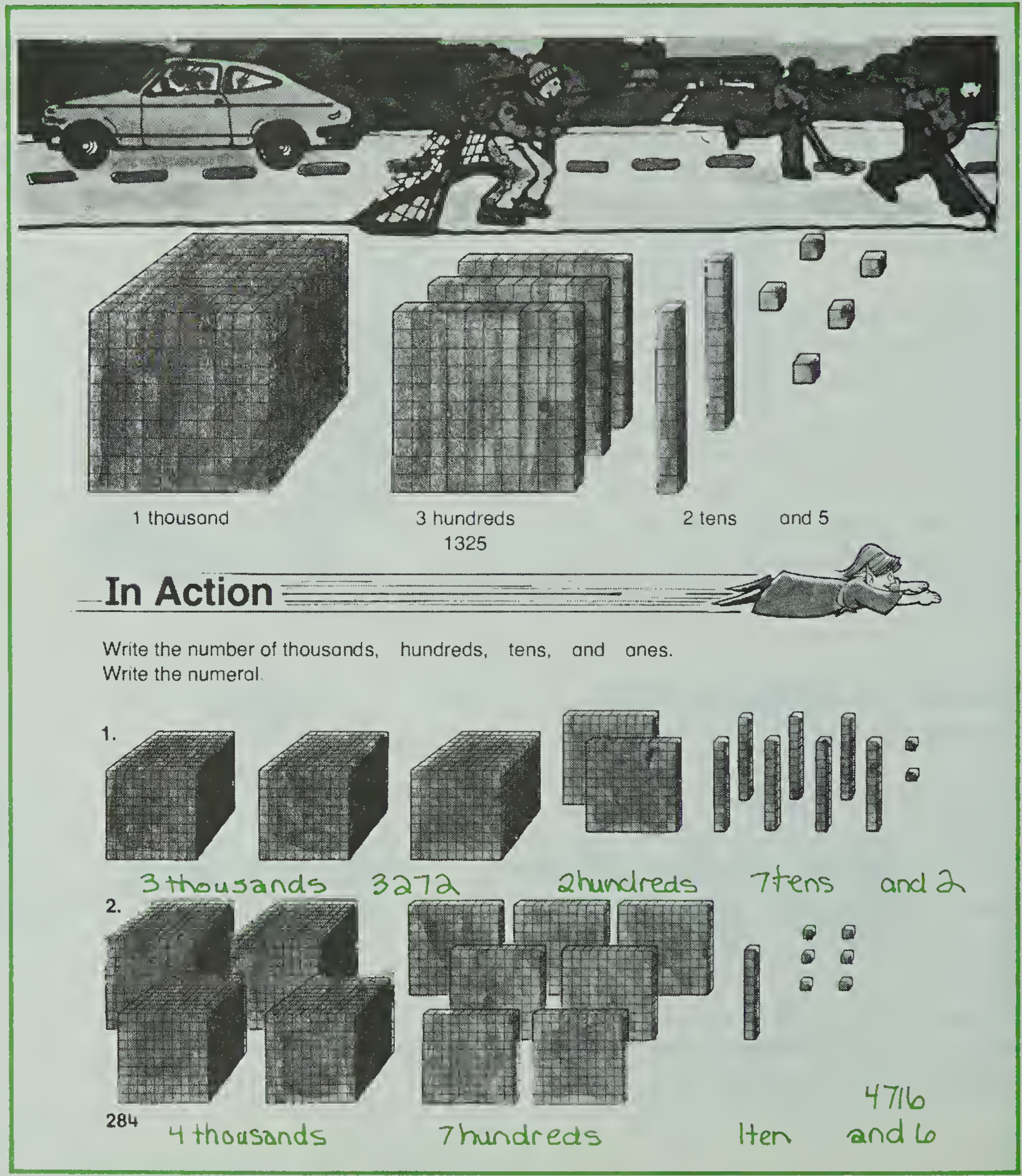
Repeat, including numbers that have zero in one or more places.

Invite each child in the group to name the four-digit number to be represented, and to record the place-value meaning and numeral on the easel.

2

Have a child write a four-digit numeral on the easel. Have each of the other children show the number with place-value materials on their mats. Ask a child to state the place-value meaning of the number.

There are 2 thousands, 6 hundreds, 1 ten and 6.



1 thousand 3 hundreds 2 tens and 5
1325

In Action

Write the number of thousands, hundreds, tens, and ones.
Write the numeral.

1. 3 thousands 3272 2hundreds 7tens and 2

2. 4 thousands 7hundreds 1ten and 6 4716

284

Repeat until each child has stated the place-value meaning of two or three numbers. Include numerals that have zero in one or more places; for example, 3040, 7002, 6501.

3

Name a four-digit number and have a child record the numeral on the easel.

Two thousand and three.

The child writes

2003

Have a second child state the place-value meaning.

There are 2 thousands, zero hundreds, zero tens and three.

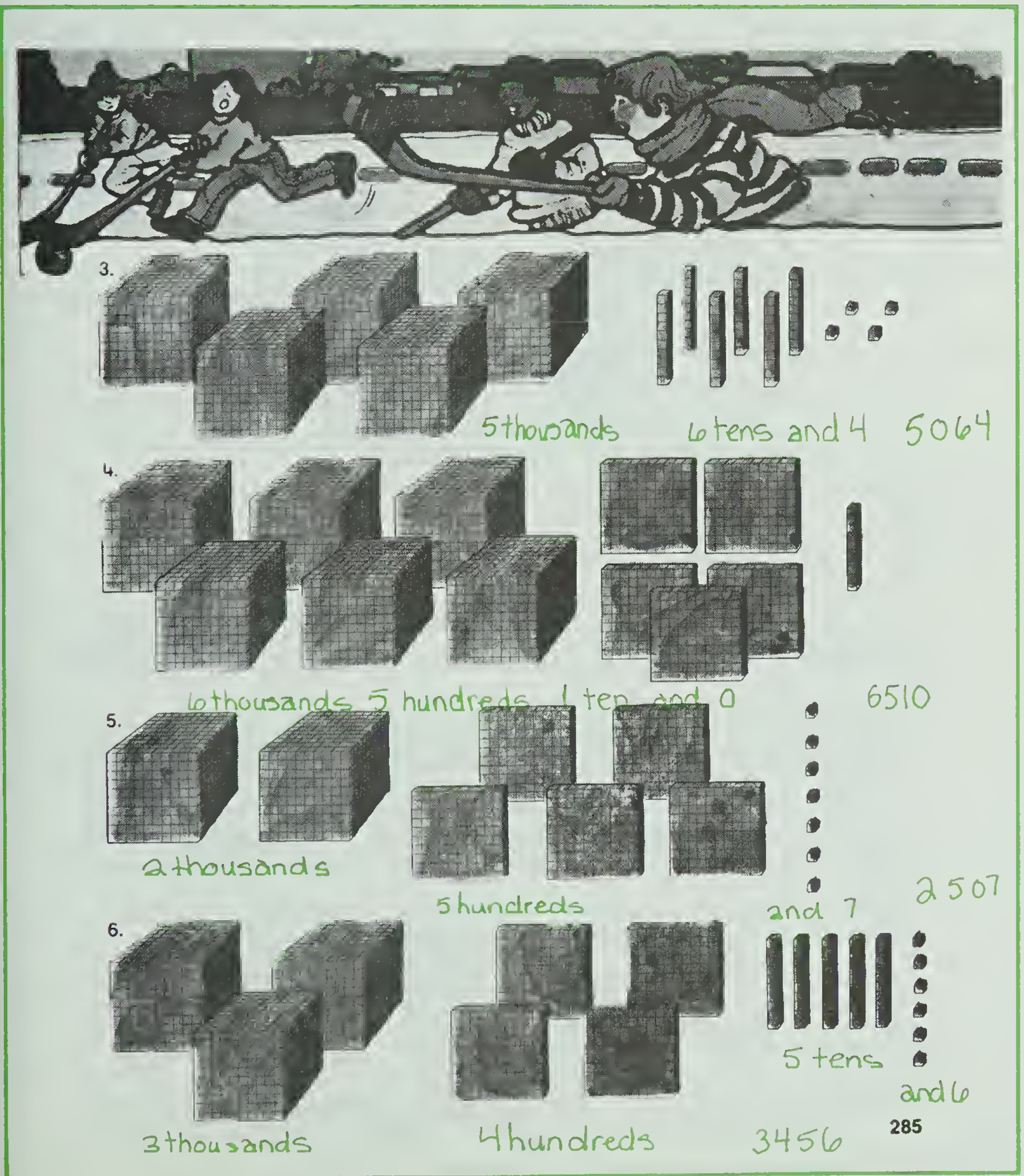
Repeat until each child in the group has written a numeral and stated the meaning of two or three numbers.

4

Have the children put their place-value materials and mats aside, and give each child an abacus. Write a numeral on the easel and demonstrate it on the abacus. Have the children follow suit, then say the number's meaning. After two or three demonstrations, have each child in turn name a four-digit number, show it on the abacus and write the numeral on the easel.

5

Using Program Master 28, make a stencil on which a different number of discs has been drawn on each abacus to represent a four-digit number. Give each child a copy. Under each abacus, the children write the appropriate numeral and the place-value meaning.



6

Write 20 four-digit numerals on the easel. Give each child a sheet of abaci reproduced from Program Master 28. On each abacus, the children draw discs to show one of the numbers on the easel. They label each abacus with the numeral represented, and the meaning.

Written and Other Activities

☐

mathways 3, pages 284, 285

Discuss the instructions for completing the In Action questions.

☐ ☐

Give each child several blank cards on which to write four-digit numerals, one on each card. The children work in pairs. One child shows a card, and the partner reads the numeral. The partners reverse roles and continue the activity.

☐ ☐ ☐

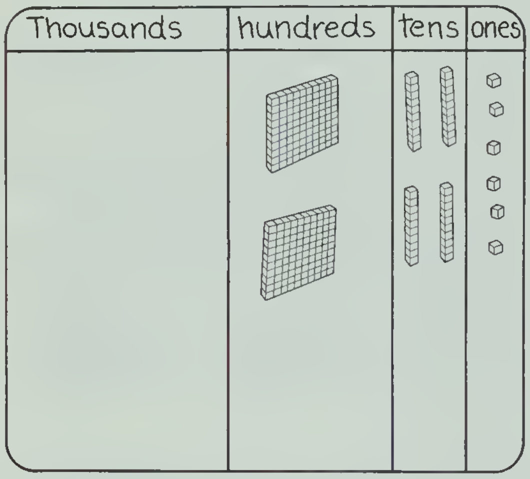
Prepare three numeral cards for each of the numbers from 0 to 9. One child in a group of four children draws four numeral cards and arranges them to show a number. The child then writes the numeral on the easel and reads the number. The next child in the group rearranges the cards to show another number, writes the numeral under the original on the easel and reads it aloud. The activity continues in this manner until no more numbers can be shown with the four cards. The cards are returned to the deck, the deck is shuffled, and the next child draws four cards to repeat the activity.

Unit 4 Section 2 Lesson 1
Writing the Meaning, the Expanded Numeral and the Standard Numeral for Four-Digit Numbers

Materials
- four decks of 20 cards, *see* ☐ ☐ ☐ ☐
- for each child
  - place-value materials
  - place-value mat
  - copy of stencil, *see* ☐ ☐

Lesson
1

Seat the children around the working area and distribute the place-value materials and mats.



Have the children show a three-digit number on their mats. Ask different children to supply the meaning, the expanded numeral and the standard numeral. Write on the easel

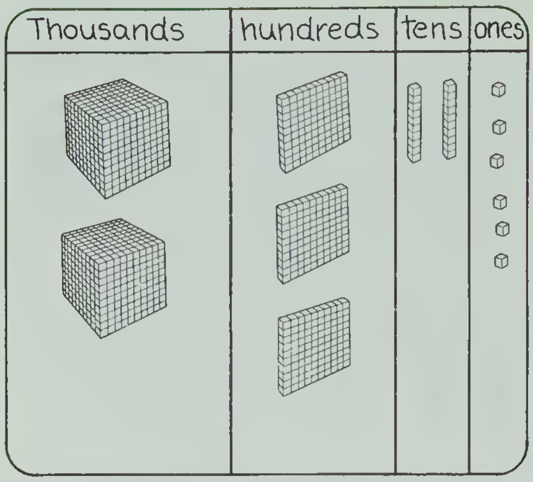
Meaning: 2 hundreds 4 tens and 6
Expanded numeral: 200 + 40 + 6
Numeral: 246

Have children show other three-digit numbers on their mats and write on the easel the meaning, and the expanded and standard forms for each.

2

Have the children show a four-digit number on their mats. Ask different children for the meaning, the expanded numeral and the standard numeral. Record on the easel

Meaning: 2 thousands 3 hundreds 2 tens and 6
Expanded numeral: 2000 + 300 + 20 + 6
Numeral: 2326



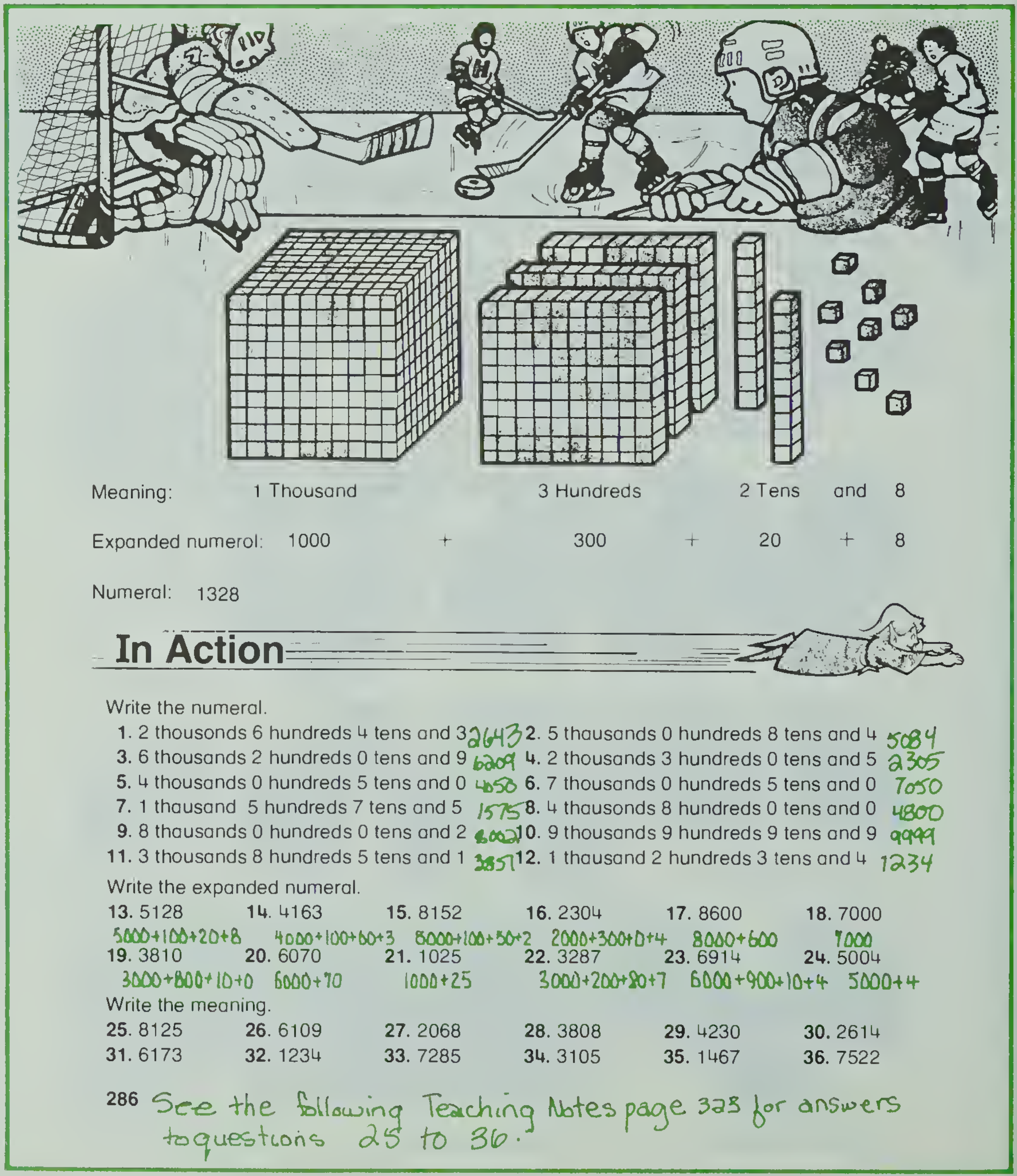
Repeat several times, asking children to suggest four-digit numerals to represent on the mats and inviting other children to record the meanings, and the expanded and standard forms on the easel.

3

Have a child write a three-digit numeral on the easel. Have one child show the number on a place-value mat. Have a second and third child write the meaning and the expanded numeral on the easel. Repeat several times. For contrast, include examples of one- and two-digit numbers.

4

Have children write four-digit numerals on the easel. Invite different children to record the meanings and expanded numerals on the easel as the group shows the numerals on place-value mats.



Meaning: 1 Thousand 3 Hundreds 2 Tens and 8
Expanded numeral: 1000 + 300 + 20 + 8
Numeral: 1328

In Action

Write the numeral.

1. 2 thousands 6 hundreds 4 tens and 3 2643
2. 5 thousands 0 hundreds 8 tens and 4 5084
3. 6 thousands 2 hundreds 0 tens and 9 6209
4. 2 thousands 3 hundreds 0 tens and 5 2305
5. 4 thousands 0 hundreds 5 tens and 0 4050
6. 7 thousands 0 hundreds 5 tens and 0 7050
7. 1 thousand 5 hundreds 7 tens and 5 1575
8. 4 thousands 8 hundreds 0 tens and 0 4800
9. 8 thousands 0 hundreds 0 tens and 2 8002
10. 9 thousands 9 hundreds 9 tens and 9 9999
11. 3 thousands 8 hundreds 5 tens and 1 3851
12. 1 thousand 2 hundreds 3 tens and 4 1234

Write the expanded numeral.

13. 5128 5000+100+20+8
14. 4163 4000+100+60+3
15. 8152 8000+100+50+2
16. 2304 2000+300+0+4
17. 8600 8000+600
18. 7000 7000
19. 3810 3000+800+10+0
20. 6070 6000+70
21. 1025 1000+25
22. 3287 3000+200+80+7
23. 6914 6000+900+10+4
24. 5004 5000+4

Write the meaning.

25. 8125
26. 6109
27. 2068
28. 3808
29. 4230
30. 2614
31. 6173
32. 1234
33. 7285
34. 3105
35. 1467
36. 7522

286 See the following Teaching Notes page 323 for answers to questions 25 to 36.

5

Write the meaning of a four-digit numeral on the easel. Have one child write the standard numeral; have another child write the expanded form. Repeat several times. For contrast, include examples of two- and three-digit numbers.

6

Write expanded numerals for several four-digit numbers on the easel. Have children record the standard numerals and the meanings.

Written and Other Activities

☐

mathways 3, page 286

☐ ☐

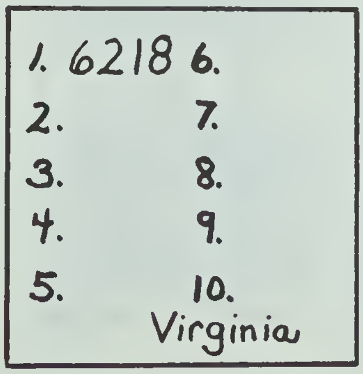
Prepare and distribute copies of a stencil such as the following:

Write the numeral.

1. *4000 + 600 + 20 + 4*
2. *2 thousands 3 hundreds 6 tens and 2*
3. *1 thousand 4 hundreds 4 tens and 1*
4. *3000 + 200 + 10 + 3*
5. *8 thousands 1 hundred 0 tens and 6*
6. *5000 + 500 + 50 + 5*
7. *4 thousands 7 hundreds 8 tens and 0*
8. *6 thousands 0 hundreds 0 tens and 5*
9. *9000 + 800 + 40 + 7*
10. *7 thousands 6 hundreds 1 ten and 3*

☐ ☐ ☐

Read 10 four-digit numbers aloud and have the children record the numerals.

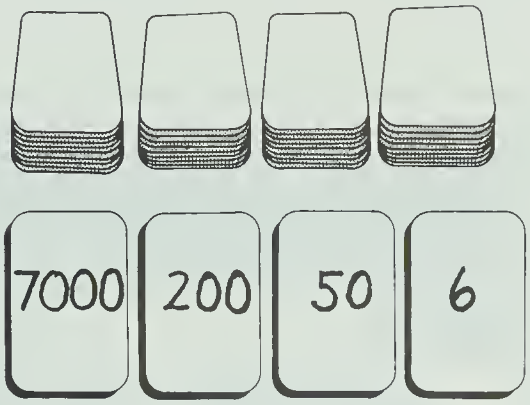


1. 6218 6.
2. 7.
3. 8.
4. 9.
5. 10.

Virginia

☐ ☐ ☐ ☐

Prepare four decks of 20 cards: the first deck containing two cards for each of the numerals 1000 to 9000; the second deck containing two cards for each of the numerals 100 to 900; the third deck having two cards for each of the numerals 10 to 90 and the fourth deck having two cards for each of the numerals 1 to 9. Have each deck shuffled and turned face down in the centre of the working area. A first player is selected in any convenient fashion. That player turns over one card from each deck and reads the resulting number aloud.



All of the children record the standard numeral.

7256

A second player turns over a card from each deck, reads the number aloud and all of the children record the standard numeral. Play continues in this fashion until the decks are depleted.

☐ ☐ ☐ ☐ ☐

For enrichment, have the children write the names of numerals; for example

Two thousand thirty-three.

Additional Answers

25. 8125 8thousands 1hundred 2tens and5
26. 6109 6thousands 1hundred 0tens and9
27. 2068 2thousands 0hundreds 6tens and8
28. 3808 3thousands 8hundreds 0tens and8
29. 4236 4thousands 2hundreds 3tens and0
30. 2614 2thousand 6hundred 1ten and4
31. 6173 6thousands 1hundreds 7tens and 3
32. 1234 1 thousand 2hundreds 3tens and4
33. 7285 7thousands 2hundreds 8tens and5
34. 3105 3thousands 1 hundred 0tens and5
35. 1467 7thousands 4hundreds 6tens and7
36. 7522 7thousands 5hundred 2tens and2

Unit 4 Section 2 Lesson 2

Using an Abacus to Represent Four-Digit Numbers; Writing Meanings and Expanded Numerals

Materials

- place-value mat and materials
- for each child
  - abacus
- for each group of four children
  - lightweight cardboard for making numeral cards, *see* **5**

Lesson

1

Seat the children around the working area and give each child an abacus. Have the children use place-value mats and materials to illustrate a four-digit number. Have them use an abacus to illustrate the same number. Have some children record the meaning, the expanded numeral and the standard form on the easel.

Meaning: 4 thousands 2 hundreds
6 tens and 1
Expanded
numeral: 4000 + 200 + 60 + 1
Numeral: 4261

Discuss that both the place-value mat and the abacus show the same number.

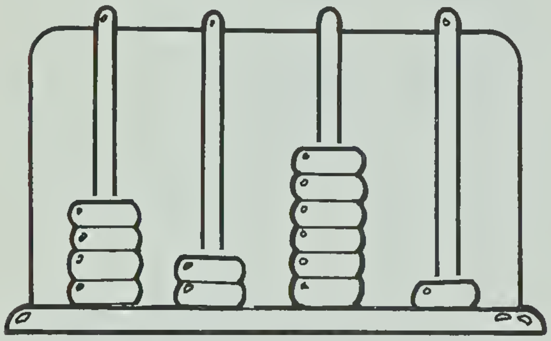
Repeat the activity several times. Include numbers that have zero in one or more places.

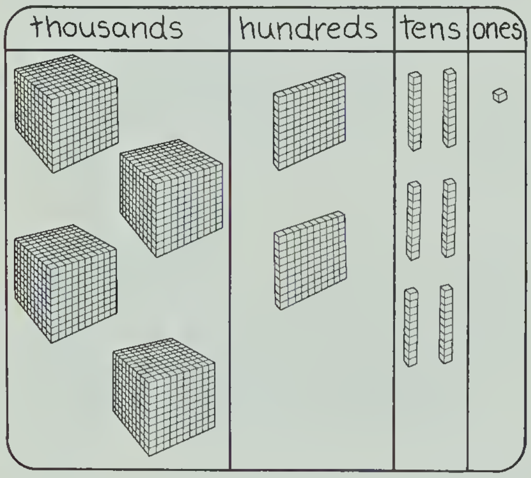
2

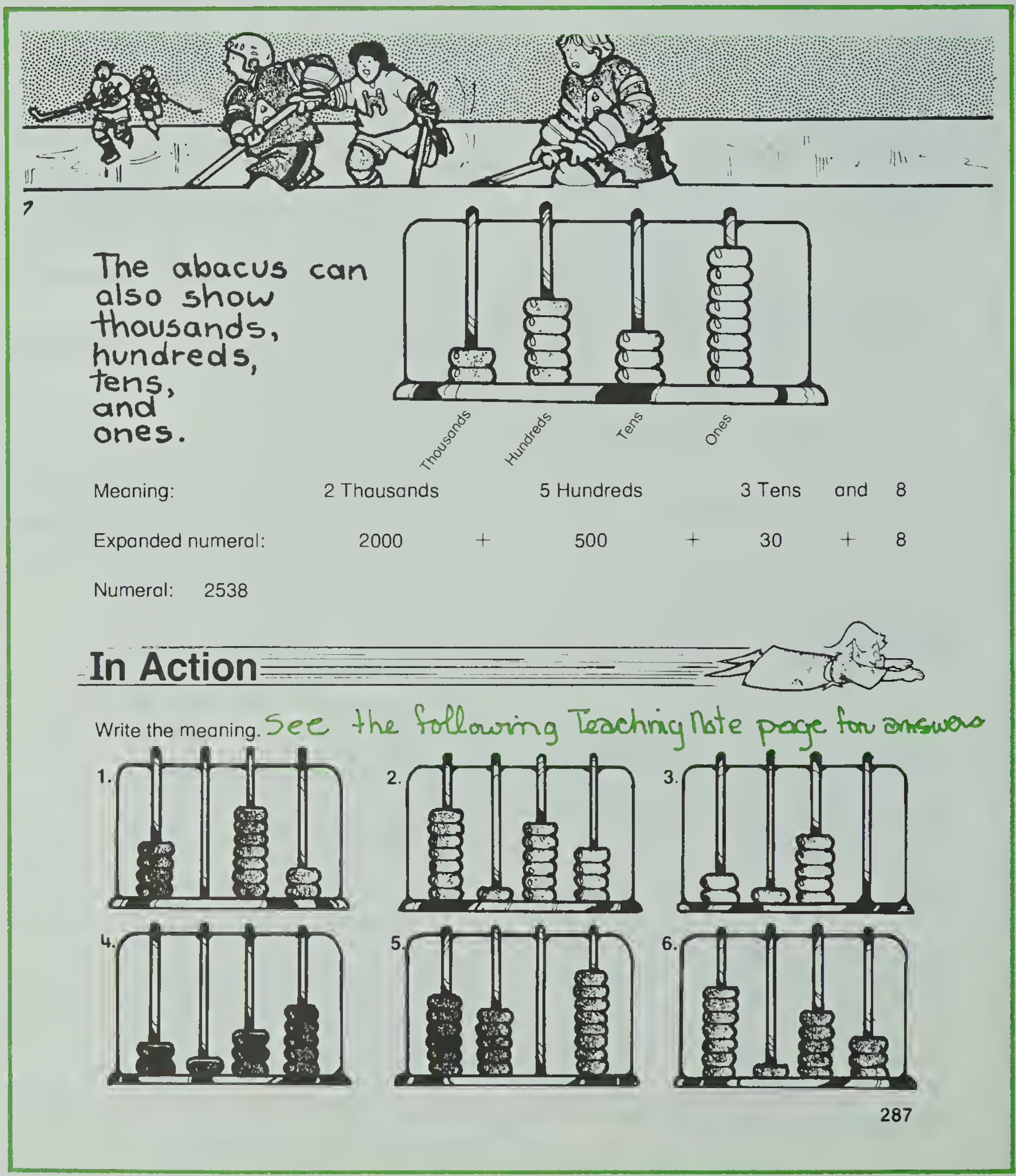
Using the place-value material and a mat, have some children illustrate a four-digit number. Have other children illustrate the same number on their abaci. Have three children record the meaning, the expanded numeral and the standard form on the easel.

3

Ask each child in the group to think of a four-digit number and illustrate it on the abacus. As each child takes a turn showing on an abacus, have the remaining children state the name of the number, and appoint a child to record the expanded and standard forms on the easel.







The abacus can also show thousands, hundreds, tens, and ones.

Thousands
Hundreds
Tens
Ones

Meaning: 2 Thousands 5 Hundreds 3 Tens and 8

Expanded numeral: 2000 + 500 + 30 + 8

Numeral: 2538

In Action

Write the meaning. See the following Teaching Note page for answers

1.
2.
3.
4.
5.
6.

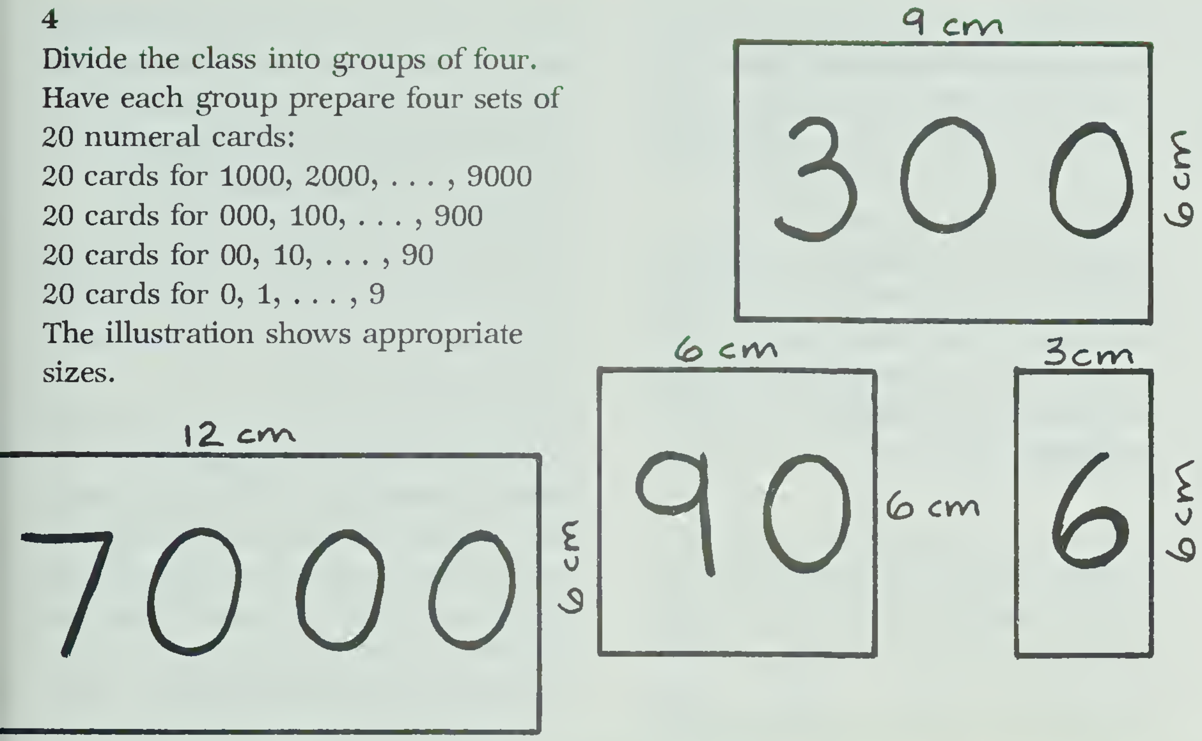
287

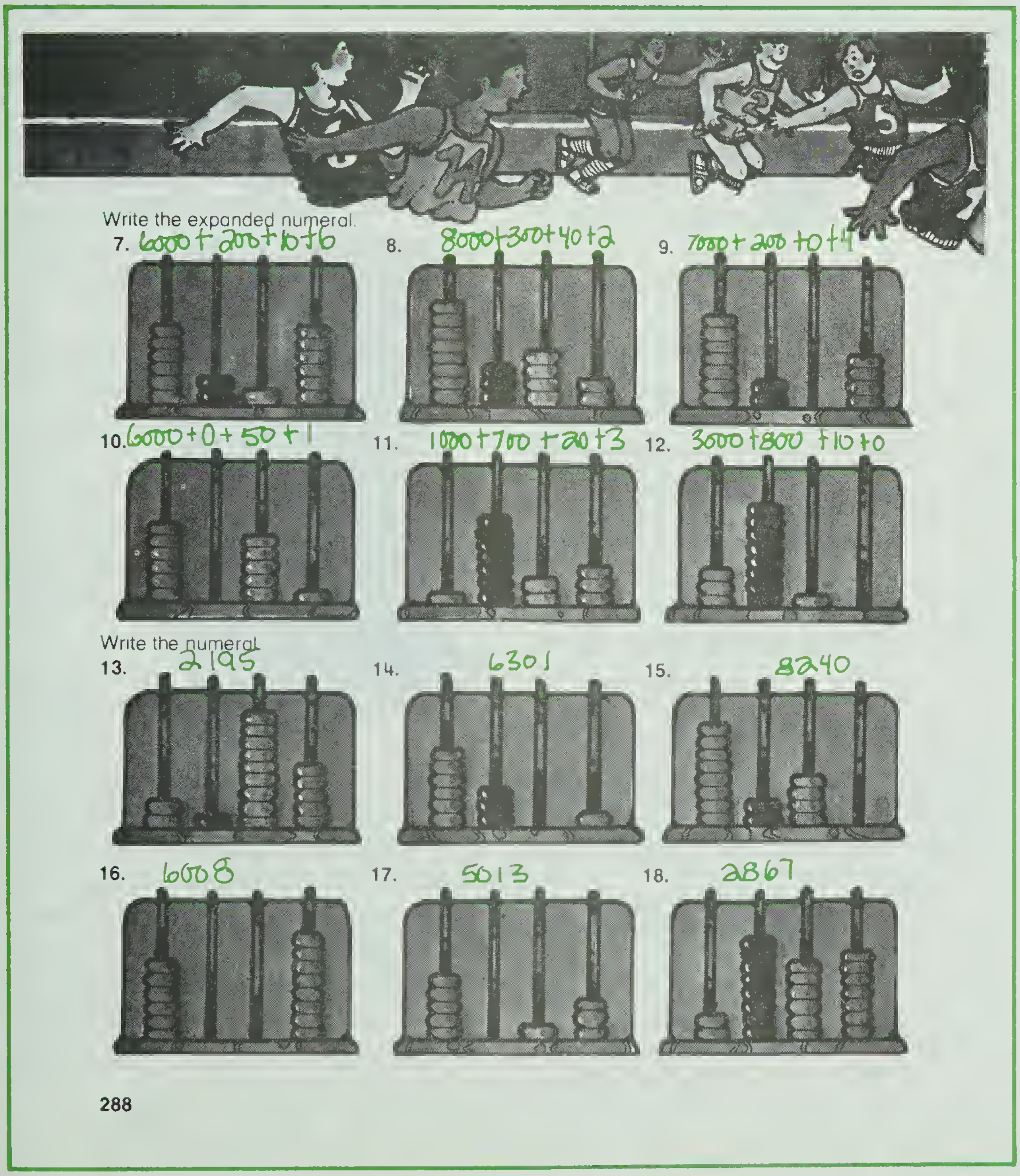
4

Divide the class into groups of four. Have each group prepare four sets of 20 numeral cards:

20 cards for 1000, 2000, . . . , 9000
20 cards for 000, 100, . . . , 900
20 cards for 00, 10, . . . , 90
20 cards for 0, 1, . . . , 9

The illustration shows appropriate sizes.





Write the expanded numeral.

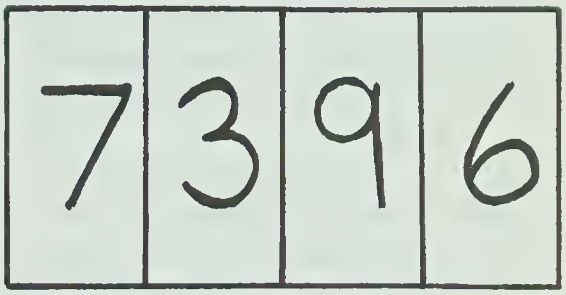
7. 6000+200+10+6
8. 8000+300+40+2
9. 7000+200+0+4
10. 6000+0+50+1
11. 1000+700+20+3
12. 3000+800+10+0

Write the numeral.

13. 2195
14. 6301
15. 8240
16. 6008
17. 5013
18. 2867

288

If the numerals are correctly positioned, the cards can be stacked to show four-digit numbers.



The numeral cards are used in the following manner:
Each child in the group takes one card from each pile, arranges the cards to show an expanded numeral, records the expanded numeral and the meaning, then stacks the cards to show the four-digit number in standard form and records the numeral. The cards are then returned to the piles and the piles are shuffled. The children draw cards from the four piles again and the activity continues.

Written and Other Activities

☐

mathways 3, pages 287, 288
Before assigning the In Action questions, discuss the example and have children read and explain the instructions.

☐ ☐

Have the children show several of the numbers illustrated on abaci on pages 287 and 288 on place-value charts.

Additional Answers

1. 4 thousands 0 hundreds 7 tens and 2
2. 7 thousands 1 hundred 6 tens and 4
3. 2 thousands 1 hundred 5 tens and 0
4. 2 thousands 1 hundred 3 tens and 5
5. 6 thousands 5 hundreds 0 tens and 8
6. 7 thousands 1 hundred 5 tens and 3

Unit 4 Section 2 Lesson 3

Writing the Year

Lesson

1

Seat the children around the working area. Have a child write the numeral for the current year on the easel, and another child write the meaning.

1985 1 thousand 9 hundreds 8 tens and 5

Have another child read the year aloud. *Nineteen eighty-five.*

Write the numerals for other years — for example, last year, next year, and so on — on the easel. Have volunteers write the meaning and read the year aloud each time.

2

Have the children say years, for example

Nineteen seventy-three
Two thousand and five
Fifteen sixteen
Nine fifty-eight

Each time, have the other children in the group write the standard numeral. Repeat until each child has named a year.

3

If it seems appropriate, explain the origin of our system for numbering years and contrast it to another system, such as the Chinese. Children from other cultures may have information to contribute to the discussion.

4

Have each child make an Age Chart. The children begin with the year of birth and give their ages in each year to 2000 A.D. For example

Year	*My Age*
1977	*0 years*
1978	*1 year*
1979	*2 years*
⋮	
2000	*23 years*

The children may enjoy extending the charts to the year in which they will be 100 years old. Alternatively, they could list the names of the members of their families and give the age of each family member during each year charted.

5

Have each child list 10 years. Assign the children the task of listing a significant event that took place in each of the years listed. These events may be the birth of family members, a community event, or a national or provincial event of historical significance. Encourage the children to interview family members or research these dates in the library. Display the lists and use them for class discussion.

Written and Other Activities

☐

mathways 3, page 289

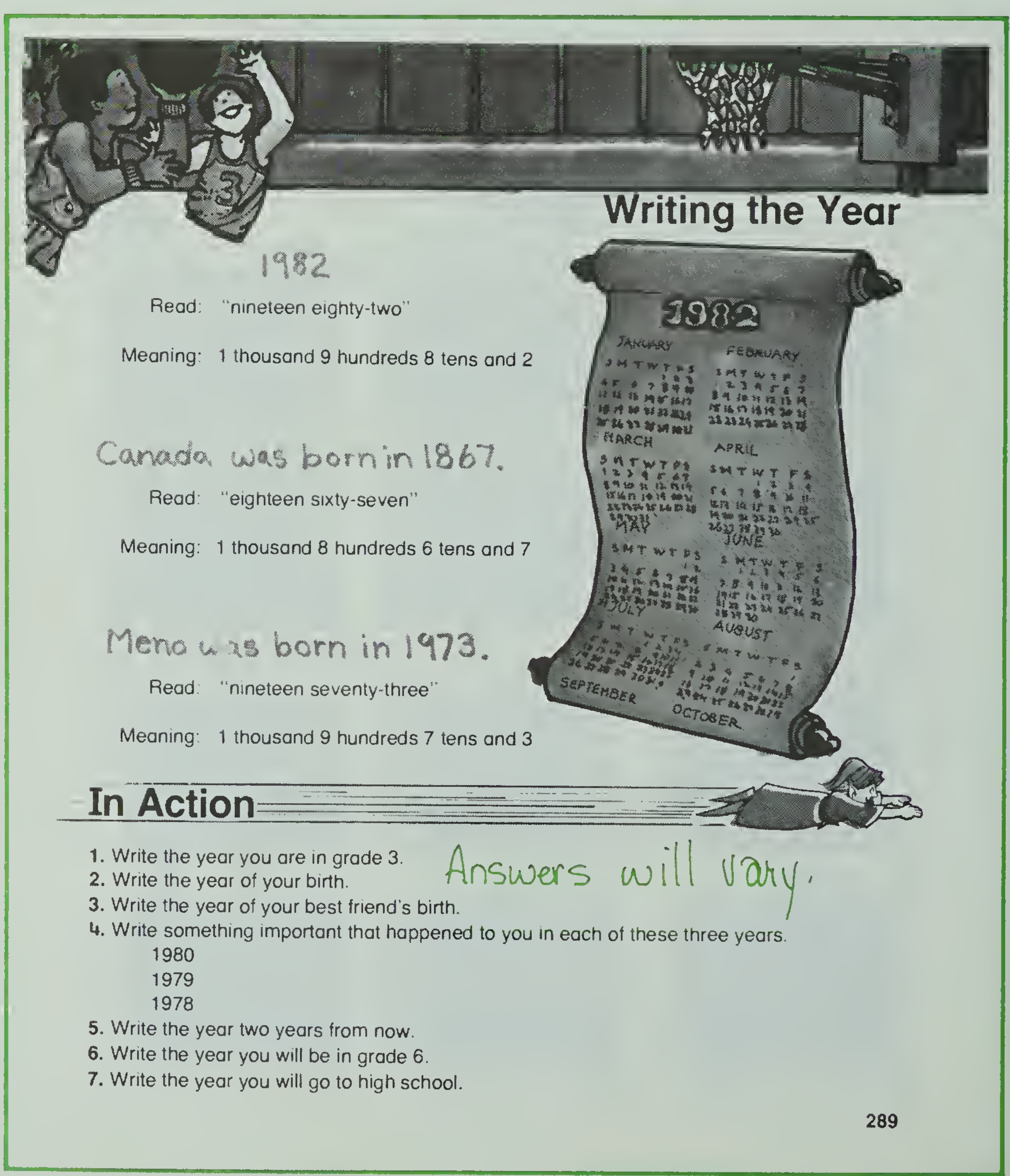
Read and discuss the examples. Have children read the In Action questions aloud. Assign the questions.

☐ ☐

Divide the class into groups of four. Assign a year in the past to each group. Suggest books that the children might refer to in order to learn about one interesting event that took place in the assigned year. Have each group dramatize an event for that year. A leader from each group states the year and briefly describes the event that will be dramatized. Then the play is presented to the class.

☐ ☐ ☐

Assign each group of four children a year in the future; for example, 1994, 2085, 3888. Give the children time to make up and rehearse an imaginative event for each of these years. When the children are ready, have the groups present their plays to the class.



Writing the Year

1982

Read: "nineteen eighty-two"

Meaning: 1 thousand 9 hundreds 8 tens and 2

Canada was born in 1867.

Read: "eighteen sixty-seven"

Meaning: 1 thousand 8 hundreds 6 tens and 7

Meno was born in 1973.

Read: "nineteen seventy-three"

Meaning: 1 thousand 9 hundreds 7 tens and 3

In Action

1. Write the year you are in grade 3.
2. Write the year of your birth.
3. Write the year of your best friend's birth.
4. Write something important that happened to you in each of these three years.
   1980
   1979
   1978
5. Write the year two years from now.
6. Write the year you will be in grade 6.
7. Write the year you will go to high school.

Answers will vary.

Unit 4 Section 2 Lesson 4

Ordering Four-Digit Numbers: The Numbers Before, After and Between

Materials

- for each child
  - abacus
  - sheet of abaci reproduced from Program Master 28
  - copy of stencil, *see*
    ☐ ☐ ☐ ☐ ☐

Lesson

1

Seat the children in a circle on the floor of the working area. Begin a counting activity: say a four-digit number and have the children count forward. The first child in the circle says the next number, the second child says the next, and so on till an instruction to stop counting is given. Repeat the activity several times. Begin with numbers that require changing the number of thousands; for example, 4997, 4998, . . ., 5001.

2

Have the children count backward from given numbers till they hear an instruction to stop counting. Include starting numbers that require a change in the number of thousands.

3

Write a one-digit numeral on the easel, for instance, *7*. Have a child record the numbers that come before and after.

6 7 8

Write a two-digit numeral on the easel and have a child write the numerals that come before and after.

36 37 38

Extend the example to a three-digit number.

436 437 438

Extend the example again, this time to a four-digit number. Write *5437* on the easel and invite a volunteer to record the numbers that come before and after. Discuss the significant digits in each case.

5436 5437 5438

Compare the examples written on the easel to show the pattern. Repeat the activity, using other extended examples.

☐ *4* ☐ ☐ *1* ☐ ☐ *9* ☐
☐ *54* ☐ ☐ *71* ☐ ☐ *99* ☐
☐ *854* ☐ ☐ *671* ☐ ☐ *199* ☐
☐ *2854* ☐ ☐ *9671* ☐ ☐ *3199* ☐

4

Write expressions such as the following on the easel, and have children record the number that comes between:

0 ☐ *2* *8* ☐ *10*
2 ☐ *4* *68* ☐ *70*
42 ☐ *44* *90* ☐ *92*
342 ☐ *344* *968* ☐ *970*
3342 ☐ *3344* *990* ☐ *992*
2990 ☐ *2992* *9968* ☐ *9970*

5

Write the meaning for a four-digit number. Have a child record the number and the numbers that are one more than and one fewer than the number.

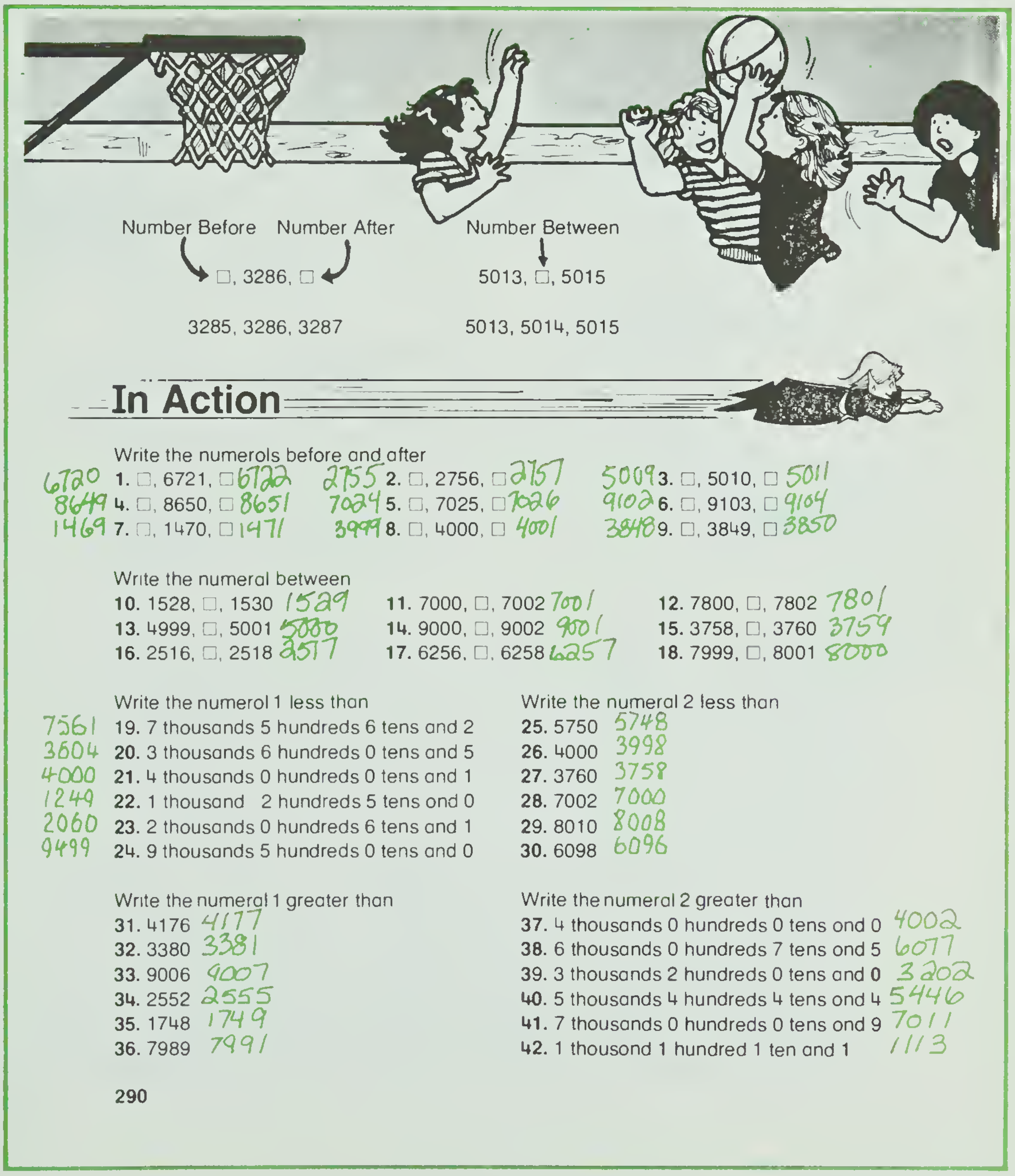
6 thousands 4 hundreds 2 tens and 7

6426 6427 6428

Repeat, giving each child an opportunity to participate.

6

Write the meaning for a four-digit number, and have a child record the number and the numbers that are two more and two fewer than the number. Repeat several times.



Number Before Number After

☐, 3286, ☐

3285, 3286, 3287

Number Between

5013, ☐, 5015

5013, 5014, 5015

In Action

Write the numerols before and after

6720 1. ☐, 6721, ☐ 6722 2755 2. ☐, 2756, ☐ 2757 5009 3. ☐, 5010, ☐ 5011
8649 4. ☐, 8650, ☐ 8651 7024 5. ☐, 7025, ☐ 7026 9102 6. ☐, 9103, ☐ 9104
1469 7. ☐, 1470, ☐ 1471 3999 8. ☐, 4000, ☐ 4001 3848 9. ☐, 3849, ☐ 3850

Write the numeral between

10. 1528, ☐, 1530 1529 11. 7000, ☐, 7002 7001 12. 7800, ☐, 7802 7801
13. 4999, ☐, 5001 5000 14. 9000, ☐, 9002 9001 15. 3758, ☐, 3760 3759
16. 2516, ☐, 2518 2517 17. 6256, ☐, 6258 6257 18. 7999, ☐, 8001 8000

Write the numerol 1 less than

7561 19. 7 thousands 5 hundreds 6 tens and 2
3604 20. 3 thousands 6 hundreds 0 tens and 5
4000 21. 4 thousands 0 hundreds 0 tens and 1
1249 22. 1 thousand 2 hundreds 5 tens ond 0
2060 23. 2 thousands 0 hundreds 6 tens and 1
9499 24. 9 thousands 5 hundreds 0 tens and 0

Write the numeral 2 less than

25. 5750 5748
26. 4000 3998
27. 3760 3758
28. 7002 7000
29. 8010 8008
30. 6098 6096

Write the numeral 1 greater than

31. 4176 4177
32. 3380 3381
33. 9006 9007
34. 2552 2555
35. 1748 1749
36. 7989 7991

Write the numeral 2 greater than

37. 4 thousands 0 hundreds 0 tens ond 0 4002
38. 6 thousands 0 hundreds 7 tens ond 5 6077
39. 3 thousands 2 hundreds 0 tens and 0 3202
40. 5 thousands 4 hundreds 4 tens ond 4 5446
41. 7 thousands 0 hundreds 0 tens ond 9 7011
42. 1 thousond 1 hundred 1 ten and 1 1113

290

7

Write pairs of numerals on the easel. Have the children write all the numerals that come between each pair.

1. *6482, 6493*
2. *1260, 1270*
3. *8992, 9020*

Written and Other Activities

☐

mathways 3, page 290

☐ ☐

Have the children illustrate two or three numbers from each set of questions on page 290 by drawing place-value materials on place-value charts.

☐ ☐ ☐

Give each child a sheet of abaci reproduced from Program Master 28. Have the children draw discs to show the numbers before and after or between for several questions on page 290 of their texts.

☐ ☐ ☐ ☐

For extra practice, give a series of instructions such as the following:

- *Write the numeral that comes before 8764.*
- *Write the numeral that comes after 6513.*
- *Write the numeral that comes between 3984 and 3986.*
- *Write the numeral that is one less than 4862.*
- *Write the numeral that is two greater than 1677.*

☐ ☐ ☐ ☐ ☐

For enrichment, distribute copies of a stencil such as the following:

Write the numeral that is 10 greater than

1. *4873*
2. *3 thousands 8 hundreds 9 tens and 5*

Write the numeral that is 10 less than

3. *6043*
4. *2 thousands 8 hundreds 7 tens and 6*

Write the numeral that is 100 greater than

5. *8999*
6. *7 thousands 0 hundreds 3 tens and 2*

Write the numeral that is 100 less than

7. *1111*
8. *3 thousands 1 hundreds 7 tens and 4*

Write the numeral that is 1000 greater than

9. *4365*
10. *5 thousands 8 hundreds 9 tens and 5*

Write the numeral that is 1000 less than

11. *3000*
12. *1 thousand 8 hundreds 4 tens and 6*

Additional Answers

mathways 3, page 291

1. 6123, 6129, 6150, 6158, 6173
2. 729, 7000, 7010, 7100, 7156
3. 3600, 3610, 3620, 3650, 3663
4. 8101, 8120, 8149, 8152, 8165
5. 7900, 7865, 7716, 5128, 4637
6. 7409, 7235, 7160, 7158, 800
7. 2187, 2090, 2015, 2009, 2001
8. 1890, 1856, 1800, 1790, 1765

Unit 4 Section 2 Lesson 5

Ordering Four-Digit Numbers: Greatest to Least, Least to Greatest

Materials

- for groups of four children
  - numeral cards prepared for TN page 325, activity 4
  - 63 game cards: 15 for each of the numerals 1, 10, 100, 1000, and three cards marked STOP!

Lesson

1

Gather the children around the easel. Have the children compare numbers by writing pairs of two-digit numerals and looping the greater number. The children may need to recall that when ordering numbers, the digit furthest left in both numbers are compared first. If these digits are the same, the digits one place to the right are compared next.

2

Write on the easel several pairs of two-digit numerals and have the children loop the lesser number in each pair.

3

Repeat activities 1 and 2, using pairs of three-digit numbers.

4

Repeat activities 1 and 2, using four-digit numbers.

5

Record several non-consecutive two-digit numerals on the easel.

56 17 29 73 84 47 52

Instruct the children to find the number that is least and record it, then find and record the number that is least among the remaining numbers and record it, and so on until all the numbers have been ordered from least to greatest. When the children have finished the task, have them order the numbers from greatest to least.

84, 73, 56, 52, 47, 29, 17

6

Repeat activity 5, using non-consecutive three-digit numbers.

7

Give each child an opportunity to record non-consecutive four-digit numerals on the easel.

3174 3520 3528 3002 3052

Have the other children order the sets from least to greatest and from greatest to least.

8

Have each group of four children prepare a deck of 63 cards. In each deck there are 15 cards for each of the numerals 1, 10, 100, 1000, and three cards marked STOP! The cards are shuffled and placed face down in the centre of the group. The players, in turn, draw cards from the deck, and place the cards in front of them until someone draws a STOP card. Play stops at this point, and the players total the numbers on their cards. The player with the greatest total scores one point.

Written and Other Activities

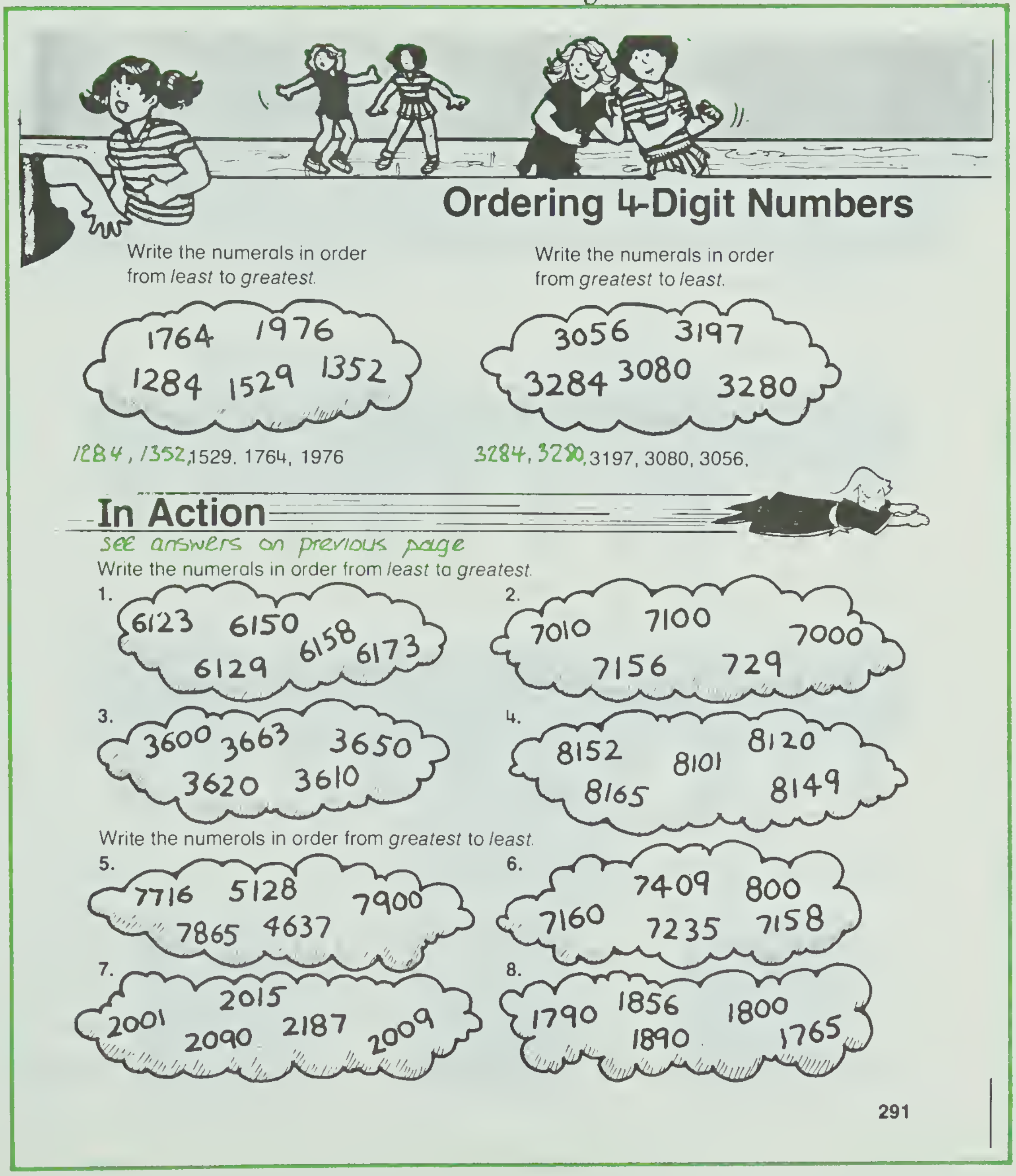
☐

mathways 3, page 291

☐ ☐

For this game, four children can use the cards prepared on Teaching Notes page 325.

Each set of cards is shuffled and placed face down in the centre of the group. The players in turn draw one card from each set. When all four players have drawn, they stack their cards to show the standard number. The player whose cards show the greatest number scores one point. The cards are returned to the correct sets, the sets are shuffled, the players draw again. The player with the greatest number of points after 10 rounds wins the game.



Ordering 4-Digit Numbers

Write the numerals in order from *least* to *greatest*.

1764 1976 1284 1529 1352

1284, 1352, 1529, 1764, 1976

Write the numerals in order from *greatest* to *least*.

3056 3197 3284 3080 3280

3284, 3280, 3197, 3080, 3056.

In Action

see answers on previous page

Write the numerals in order from *least* to *greatest*.

1. 6123 6150 6158 6173 6129
2. 7010 7100 7000 7156 729
3. 3600 3663 3650 3620 3610
4. 8152 8101 8120 8165 8149

Write the numerols in order from *greatest* to *least*.

5. 7716 5128 7900 7865 4637
6. 7409 800 7160 7235 7158
7. 2015 2001 2090 2187 2009
8. 1790 1856 1800 1890 1765

291

Unit 4 Section 2 Lesson 6

Completing Number Patterns

Materials

- several copies of Program Masters 18 and 28 (abaci and place-value mats), *see* ☐ ☐
- several abaci
- place-value materials and mats

Lesson

1

Gather the children around the easel. Write two simple number patterns:

1, 2, 3, ☐, ☐, ☐
2, 4, 6, ☐, ☐, ☐

I have written two number patterns on the easel. How would you complete the first pattern, Michael?

How can you tell which numbers come next?

Manage the discussion to show that the rule governing 1, 2, 3, is that each number in the pattern shall increase by one. Have one of the children complete it.

Look at the next pattern Sarah. What can you tell us about the rule for completing the pattern?

Help the children understand that the rule is that each number in the series shall increase by two.

Write another pattern on the easel.

103, 105, 107, ☐, ☐, ☐

Discuss the pattern until the children see the similarity between it and the last pattern. Encourage them to note any differences. Some children may see that the first pattern consists of even numbers, while the second consists of odd numbers. Continue writing number patterns on the easel and discussing the rule for each. The children may enjoy completing patterns such as the following:

21, 18, 15, ☐, ☐, ☐
357, 354, 351, ☐, ☐, ☐
610, 604, 598, ☐, ☐, ☐
8964, 8966, 8968, ☐, ☐, ☐
2323, 2320, 2317, ☐, ☐, ☐
5985, 5990, 5995, ☐, ☐, ☐
2840, 2830, 2820, ☐, ☐, ☐
1010, 1007, 1004, ☐, ☐, ☐

2

Invite the children to make up number patterns of their own. Pairs of children may enjoy working together. Ask each pair of children to create 10 number patterns consisting of six four-digit numbers. When the task is finished, have pairs of children exchange patterns with other pairs and complete the patterns created by their classmates. At the conclusion of the activity, invite individuals to describe some of the patterns they dealt with. Show the patterns on the overhead projector so that everyone can participate in the discussion.

Written and Other Activities

☐

mathways 3, page 292

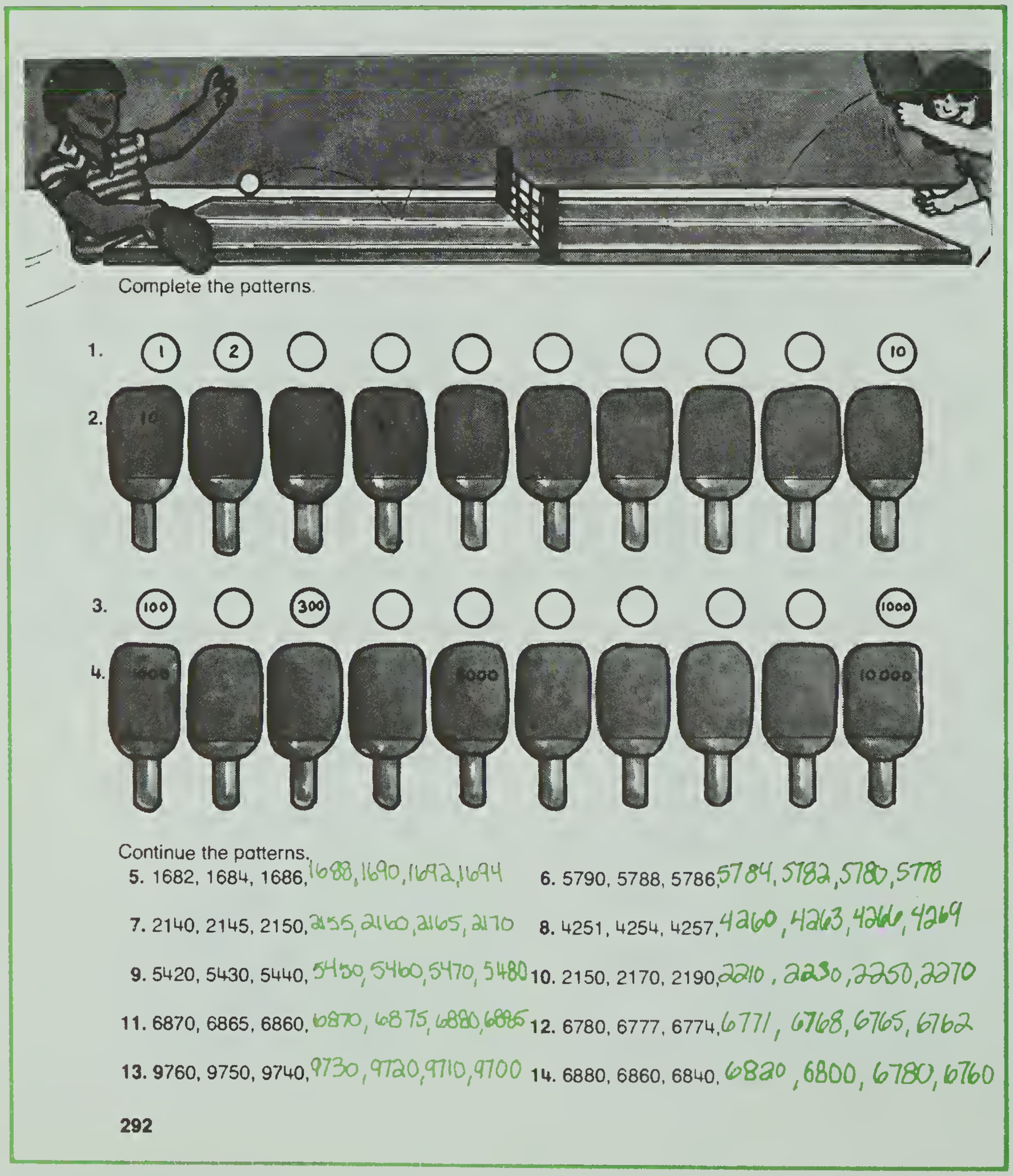
Discuss each of the examples, inviting children to comment on how the illustration helps to show the rule for the pattern in each case.

☐ ☐

Have each child illustrate one of the patterns completed for *mathways 3* page 292 by drawing discs on abaci. Copies of Program Master 28 could be distributed to each child. Give the children an example of each way of illustrating a number pattern, so that they will have models to follow.

☐ ☐ ☐

Have each child in the group make up a number pattern and demonstrate the first three numbers on an abacus. After each demonstration, the other children in the group complete the pattern on paper.



Complete the patterns.

Continue the patterns.

5. 1682, 1684, 1686, 1688, 1690, 1692, 1694
6. 5790, 5788, 5786, 5784, 5782, 5780, 5778
7. 2140, 2145, 2150, 2155, 2160, 2165, 2170
8. 4251, 4254, 4257, 4260, 4263, 4266, 4269
9. 5420, 5430, 5440, 5450, 5460, 5470, 5480
10. 2150, 2170, 2190, 2210, 2230, 2250, 2270
11. 6870, 6865, 6860, 6870, 6875, 6880, 6885
12. 6780, 6777, 6774, 6771, 6768, 6765, 6762
13. 9760, 9750, 9740, 9730, 9720, 9710, 9700
14. 6880, 6860, 6840, 6820, 6800, 6780, 6760

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Unit 4 Section 3 Lesson 1

Exploring Decimals: Hundredths

Materials

- for illustrating tenths
  - nine fractional pies, each one coloured to show a decimal from 0.1 to 0.9
  - nine 30 cm by 3 cm rectangles divided into tenths, each coloured to show a decimal from 0.1 to 0.9
  - nine rectangles divided into two rows of five squares, each coloured to show a decimal from 0.1 to 0.9
- for illustrating hundredths
  - eight squares divided into hundredths and coloured to show decimals 0.01, 0.05, 0.10, 0.17, 0.30, 0.54, 0.83, 0.98
- for each child
  - sheet of 1 cm graph paper cut into ten 10 cm by 10 cm squares made from Program Master 5
- for groups of two or three children
  - 10 cm by 10 cm square of 1 cm graph paper for each participant
- die marked 0.05, 0.08, 0.11, 0.02, 0.15, 0.20

Lesson

1

Seat the children around the working area. Display a fractional pie illustrating 0.1. Ask

How many equal parts are there?

How many of the parts are coloured red?

What fraction can we write to show one of 10 equal parts?

Write the fraction on the easel, explaining that the 10 shows the number of equal parts and the 1 shows the number of parts being considered.

What decimal number can we write to show one of ten equal parts?

Write 0.1 on the easel, and have a child read

Zero decimal one.

Show and discuss the other materials illustrating one-tenth, or 0.1, so that the children can compare and discover the similarities in several representations. Repeat the procedure for illustrating decimal tenths to 0.9. Invite the children to record the fraction and the decimal for each.

2

Name decimals 0.1 to 0.9, for example

Zero decimal three.

Have a child select the picture that illustrates each decimal named.

3

Show the illustration for 0.01.

Discuss the illustration, comparing it to the illustration for 0.1 to show that something divided into 10 equal parts can also be divided into 100 equal parts. Each part is then called a hundredth and can be written as the fraction $\frac{1}{100}$, showing one of 100 equal parts, or the decimal 0.01. Write the fraction and the decimal on the easel, saying

One of 100 equal parts.

Zero decimal zero one.

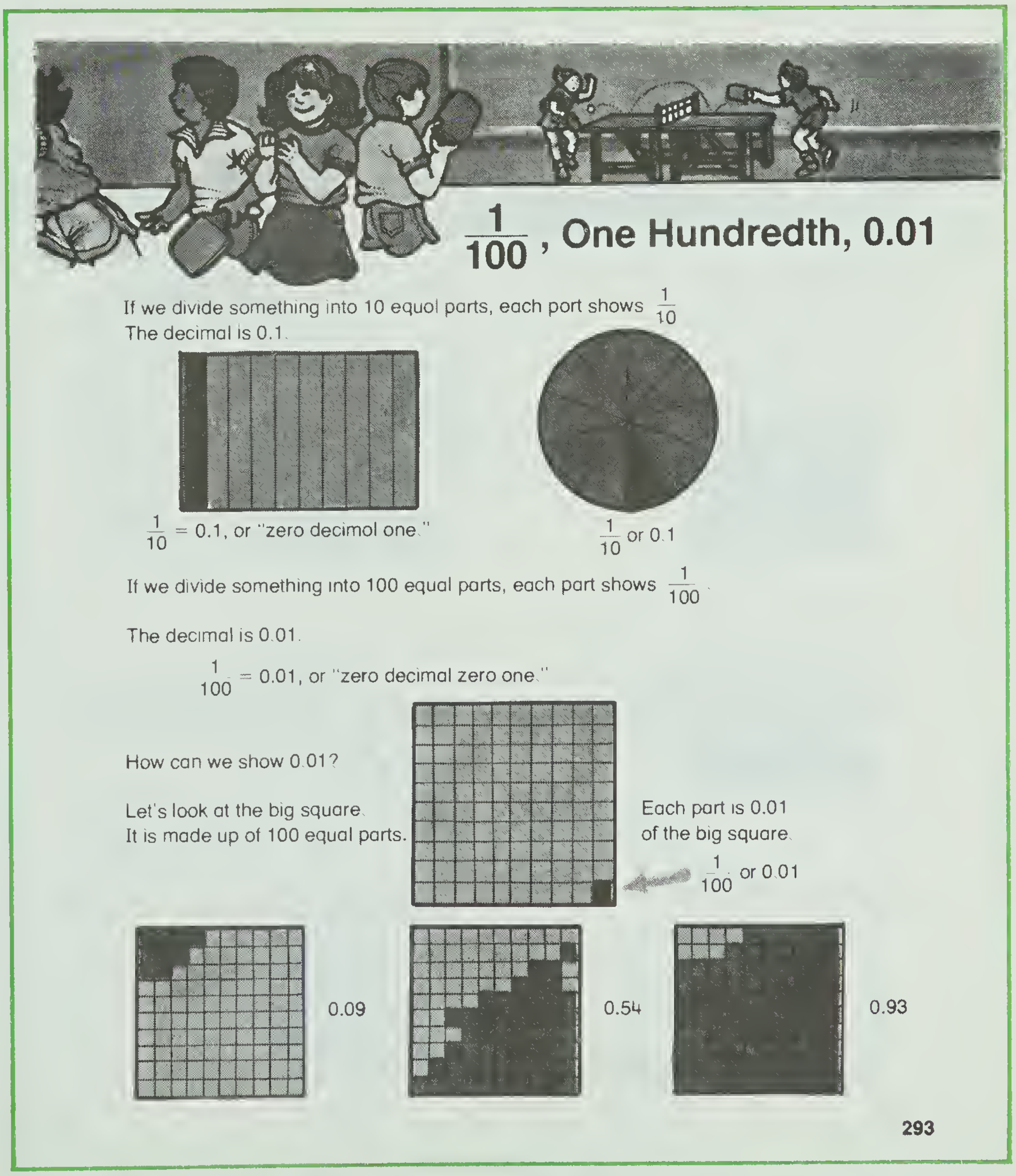
Discuss that both the fraction and the decimal represent one-hundredth.

Follow the same procedure to introduce other decimal hundredths. Each time, ask a child to write the fraction and the decimal on the easel, explaining that decimals for hundredths have two digits to the right of the decimal point.

4

Name a fraction and decimal, for example

Five hundredths. Zero decimal zero five.



$\frac{1}{100}$, One Hundredth, 0.01

If we divide something into 10 equal parts, each part shows $\frac{1}{10}$.
The decimal is 0.1.

$\frac{1}{10}$ = 0.1, or "zero decimal one."

$\frac{1}{10}$ or 0.1

If we divide something into 100 equal parts, each part shows $\frac{1}{100}$.

The decimal is 0.01.

$\frac{1}{100}$ = 0.01, or "zero decimal zero one."

How can we show 0.01?

Let's look at the big square.
It is made up of 100 equal parts.

Each part is 0.01 of the big square.

$\frac{1}{100}$ or 0.01

0.09

0.54

0.93

293

Ask a child to select the illustration that shows the decimal. Have another child write the fraction and the decimal on the easel. Repeat the procedure, naming each of the other decimal hundredths illustrated and giving each child in the group an opportunity to identify an illustration and write a fraction and decimal on the easel.

5

Give each child ten 10 cm by 10 cm squares of 1 cm graph paper reproduced from Program Master 5. Write 10 decimals for hundredths on the easel. Have the children colour squares to show each decimal, and label each section with the corresponding fraction and decimal. Display the children's work in the classroom.

Written and Other Activities

☐

mathways 3, pages 293, 294

Discuss the illustrations and information given on page 293. Compare the illustrations to the materials used during the lesson. Assign the In Action activity.

☐ ☐

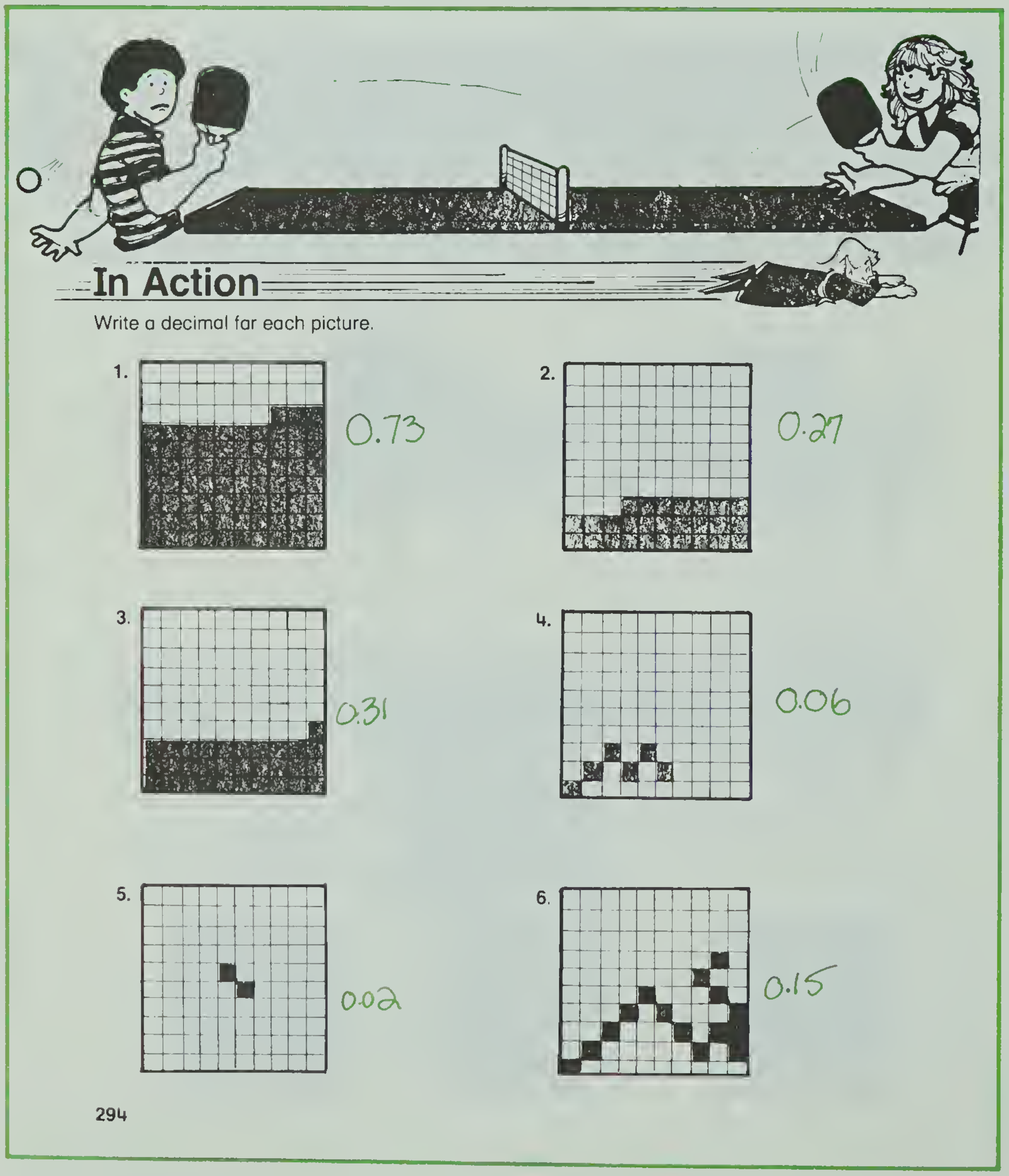
The following game can be played by two or three children: Each participant is given a 10 cm by 10 cm section of 1 cm graph paper. The players take turns rolling a die marked 0.05, 0.08, 0.11, 0.02, 0.15 and 0.20 and colouring the number of squares indicated by the decimal on the upturned face of the die. The first player to colour all the squares is the winner.

☐ ☐ ☐

Give the children a practice exercise such as the following:

Write the fraction and the decimal for one-hundredth.
Write the fraction for zero decimal zero five.
Write the decimal for six-tenths.
Write the fraction for zero decimal nine.

Continue until the children have recorded at least 10 decimals and fractions for hundredths and tenths.



In Action

Write a decimal for each picture.

1. 0.73
2. 0.27
3. 0.31
4. 0.06
5. 0.02
6. 0.15

294

Unit 4 Section 3 Lesson 2

Relating Decimals to Centimetres and Metres

Materials

- illustrations for hundredths prepared for the preceeding page
- for each child
  - ruler marked in centimetres
  - metre stick marked in centimetres

Rationale

Since decimals rather than fractions are used for units of measurement, decimals form an important part of the *mathways* program.

Combining the topics of decimals and linear measurement is a natural way of emphasizing the simplicity and convenience of decimals in a real-life setting. Activities that reflect this combination help the children to become more aware of their environment and provide opportunities to practise numerical operations with decimals while gaining valuable experience in measuring.

Lesson

1

Gather the children around the working area. Show materials illustrating various decimal hundredths. Invite children to name the decimal being illustrated and write the decimal number on the easel.

2

Distribute metre sticks, giving one to every two children. Have the children examine the metre sticks and report the number of centimetres marked on each stick. When it has been established that there are 100 cm in each metre and that each centimetre is equal, discuss with the children that each centimetre is one-hundredth of one metre. Have the children recall the decimal for one-hundredth. Write on the easel

100 cm = *1* m
1 cm = *0.01* m

Have a child read the expressions on the easel. Extend the discussion, explaining that 2 cm is two-hundredths of a metre and can therefore be expressed by the decimal and symbol 0.02 m, that 3 cm is 0.03 m, . . ., 11 cm is 0.11 m and so on.

3

Point to various lengths on the metre stick. Each time, have the children name the decimal and unit and write the decimal and symbol; that is, seeing 27 cm, the children say

Zero decimal twenty-seven metres

and write

0.27 m

Or, after locating 15 cm, 8 cm and 49 cm respectively, children say and write

Zero decimal fifteen metres *0.15* m
Zero decimal zero eight metres *0.08* m
Zero decimal forty-nine metres *0.49* m

Continue the activity until it is apparent that the children understand the principle and can apply it to any length on the metre stick.

4

Write a variety of lengths on the easel, for example

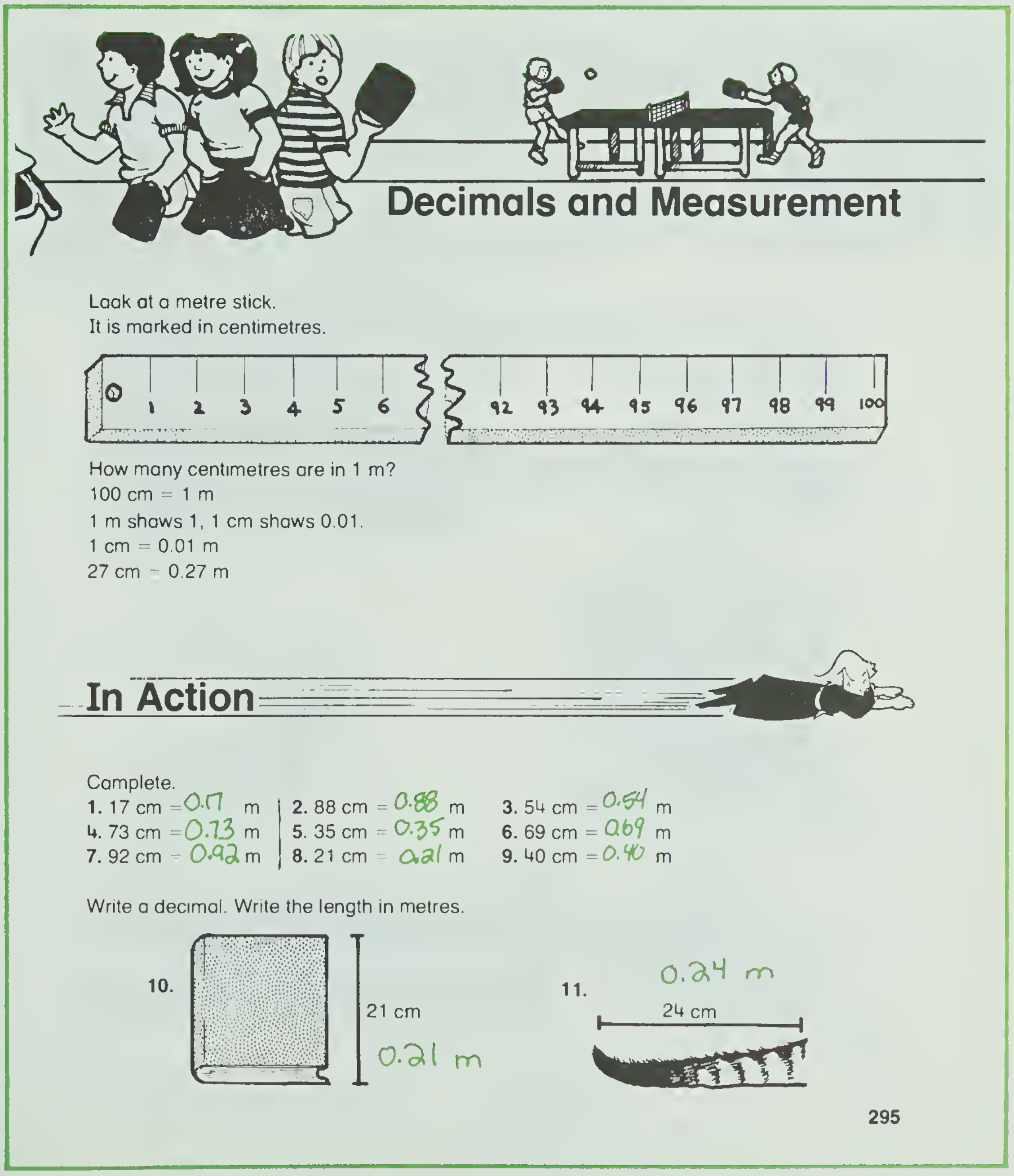
0.02 m 0.10 m *0.35* m *0.42* m *0.99* m

Have children point to each length on the metre stick and write the number of centimetres and the symbol on the easel.

2 cm *10* cm 35 cm *42* cm *99* cm

5

Have each child make a chart such as the following:



Decimals and Measurement

Look at a metre stick.
It is marked in centimetres.

How many centimetres are in 1 m?
100 cm = 1 m
1 m shows 1, 1 cm shows 0.01.
1 cm = 0.01 m
27 cm = 0.27 m

In Action

Complete.
1. 17 cm = 0.17 m
2. 88 cm = 0.88 m
3. 54 cm = 0.54 m
4. 73 cm = 0.73 m
5. 35 cm = 0.35 m
6. 69 cm = 0.69 m
7. 92 cm = 0.92 m
8. 21 cm = 0.21 m
9. 40 cm = 0.40 m

Write a decimal. Write the length in metres.

10. 0.21 m

11. 0.24 m

Object	Estimate in centimetres	Measurement in centimetres	Length in metres

Have the children work in pairs to measure various objects in the classroom and fill in the chart.
A similar chart can be used for estimating, measuring and recording lengths in metres:

Object	Estimate in metres	Measurement in metres	Length in centimetres

6
Give each pair of children a metre stick. One child points to a length on the metre stick and the other child says the length in centimetres and in metres. The children reverse roles and repeat. After a time, change the directions. One child says a length in centimetres and the other child points out the length on the metre stick and states the length in metres.

7
Gather the children together again. Distribute paper and invite each child in the group to draw a line segment estimated to be 0.05 m long. Each child measures the line and records its actual length in metres. Give the children several opportunities to estimate, draw, measure and record various line lengths in metres.

Written and Other Activities

☐

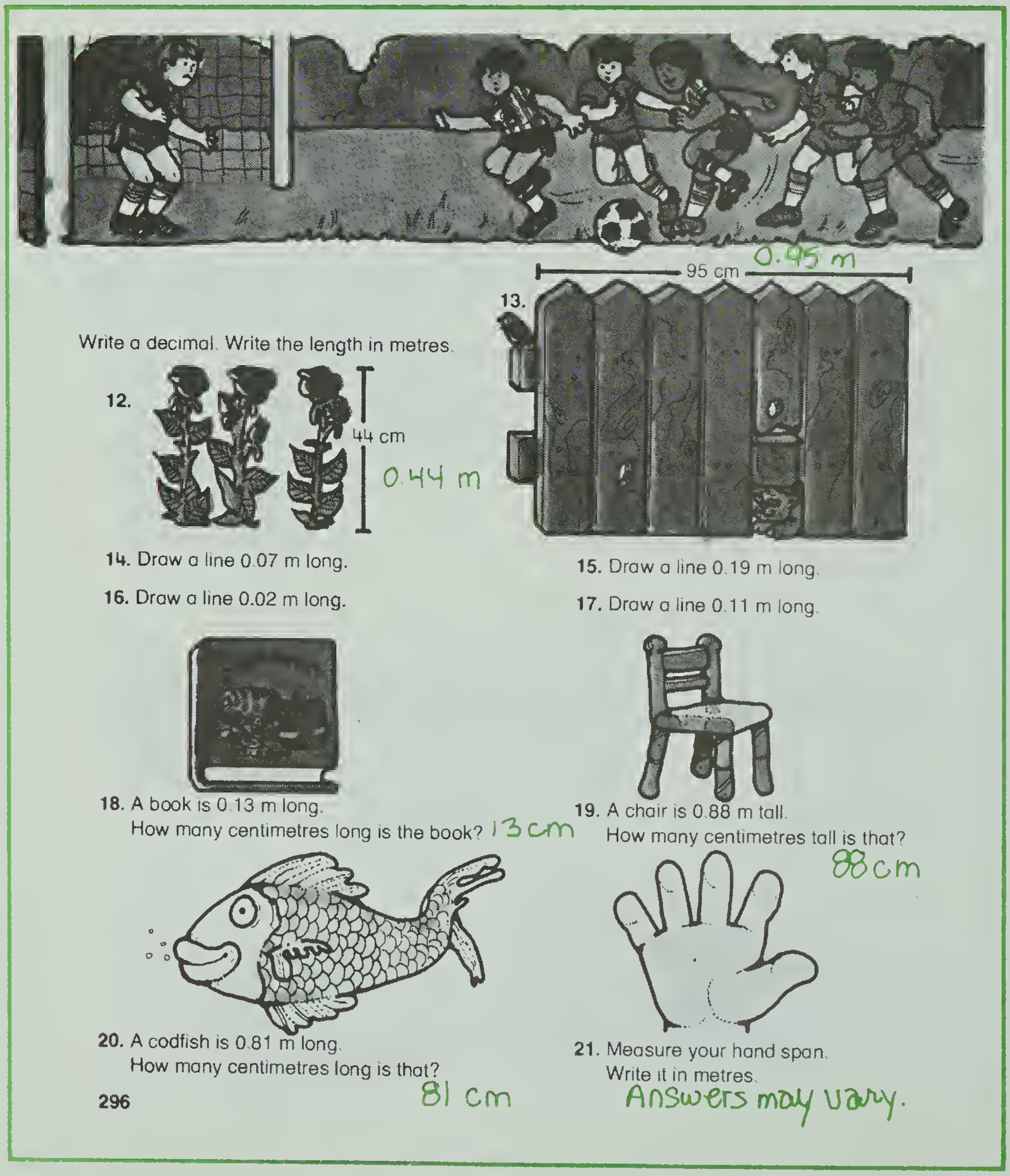
mathways 3, pages 295, 296
Discuss the example, relating the illustrations and information to activities performed during the lesson. Have individuals explain how they will complete the In Action questions. Some children may need help to successfully convert centimetres to metres.

☐ ☐

Have the children make charts such as these:

centimetres	metres
1 cm	0.01 m
2 cm	0.02 m
3 cm	0.03 m
⋮	⋮
99 cm	0.99 m

metres	centimetres
0.01 m	1 cm
0.02 m	2 cm
0.03 m	3 cm
⋮	⋮
0.99 m	99 cm



13.

Write a decimal. Write the length in metres.

12.

14. Draw a line 0.07 m long.

15. Draw a line 0.19 m long.

16. Draw a line 0.02 m long.

17. Draw a line 0.11 m long.

18. A book is 0.13 m long.
How many centimetres long is the book? 13 cm

19. A chair is 0.88 m tall.
How many centimetres tall is that? 88 cm

20. A codfish is 0.81 m long.
How many centimetres long is that? 81 cm

21. Measure your hand span.
Write it in metres. Answers may vary.

296

Unit 4 Section 3 Lesson 3

Exploring Millimetres

Materials

- for each child
    - metre stick marked in centimetres and millimetres
    - ruler marked in centimetres and millimetres
- for each pair of children
    - metre stick

Rationale

Before being asked to measure objects in millimetres, the children should be fairly skilled at estimating the length of a given object in centimetres. For this reason the *mathways* program has been designed to give the children many experiences in estimating and measuring lengths, and this lesson on millimetres begins with a basic review. Still, some children may require a more intensive recall of the concept of centimetres. To accommodate these special needs and prepare particular children for the ideas and relationships explored in this and following lessons, small groups can be given special assignments in advance. Such assignments might consist of adaptations of activities described for earlier lessons on linear measurement, and should focus mainly on estimating and verifying estimates.

Lesson

1

Gather the children around the working area and give each child a ruler. To begin the lesson, invite every child to draw on paper a line estimated to be 5 cm long. Have the children measure the lines and record the length of each line to the nearest centimetre. Repeat for 1 cm, 10 cm, 15 cm and 20 cm.

2

Give each pair of children a metre stick. Have the children estimate the length of various objects in the classroom, and record the estimates on paper. Instruct the children to use the metre sticks or rulers — whichever is more appropriate — to measure the objects, and then record the actual measurements to the nearest centimetre.

3

Discuss the children's experiences in measuring; and that all the lengths were not an exact number of centimetres. Using a ruler to illustrate, point out that there is a smaller unit of length called a millimetre, which can be used to measure objects more accurately.

Discuss the relationship between centimetres and millimetres. Have the children locate the millimetre marks on their rulers and on the metre sticks, and count the millimetres between the first and second centimetre, the second and third centimetre, and so on, to establish that there are 10 mm in every centimetre. Record on the easel

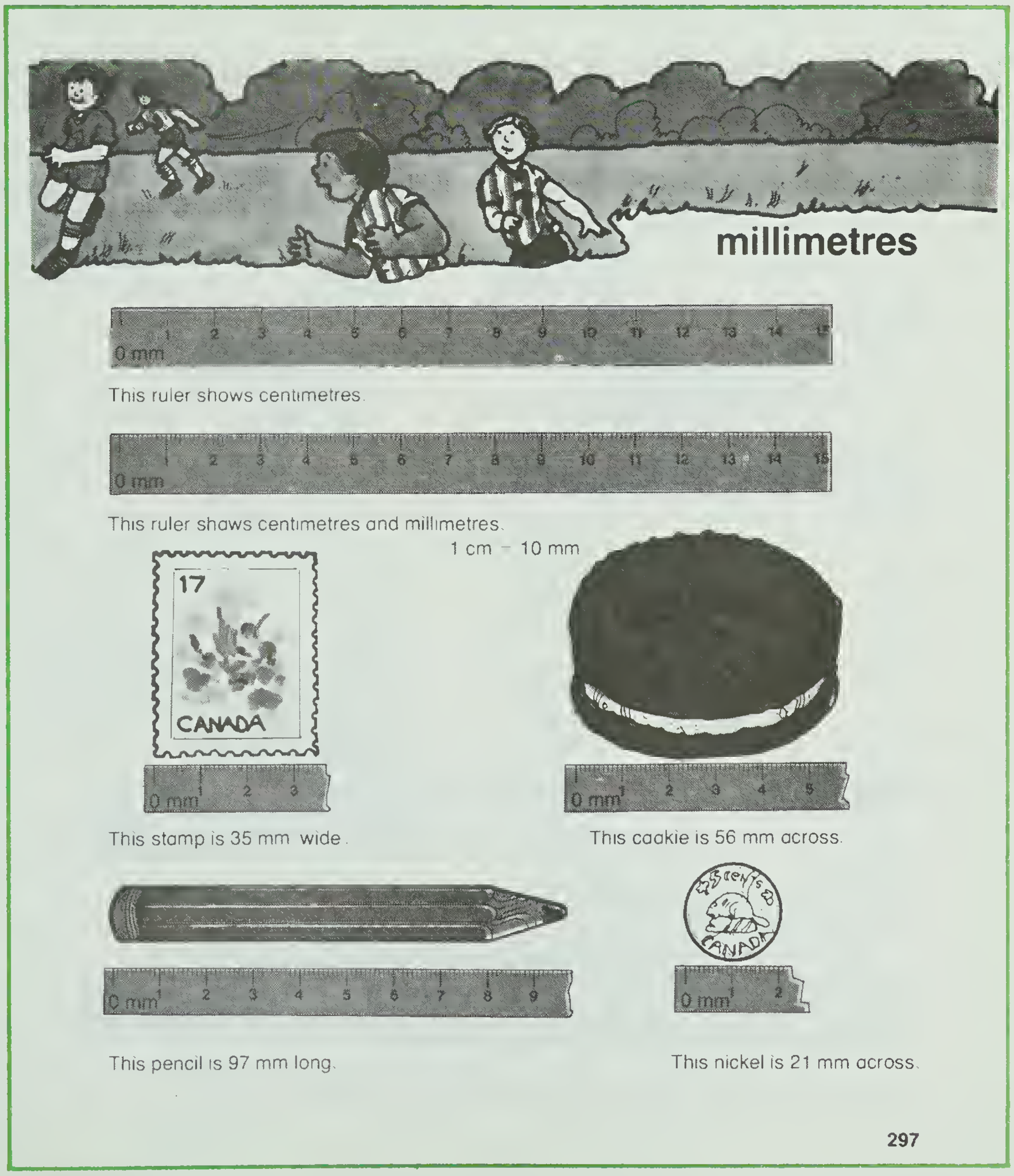
millimetre mm
1 cm = *10* mm

Then ask

Robert, how many millimetres are there in 1 cm*?*
How many millimetres are in 2 cm, *Kathleen?*
How many in 3 cm*? . . . 9* cm*? . . . 10* cm*?*

record on the easel

1 cm = *10* mm
2 cm = *20* mm
3 cm = *30* mm
⋮
10 cm = *100* mm



millimetres

This ruler shows centimetres.

This ruler shows centimetres and millimetres.

1 cm = 10 mm

This stamp is 35 mm wide.

This cookie is 56 mm across.

This pencil is 97 mm long.

This nickel is 21 mm across.

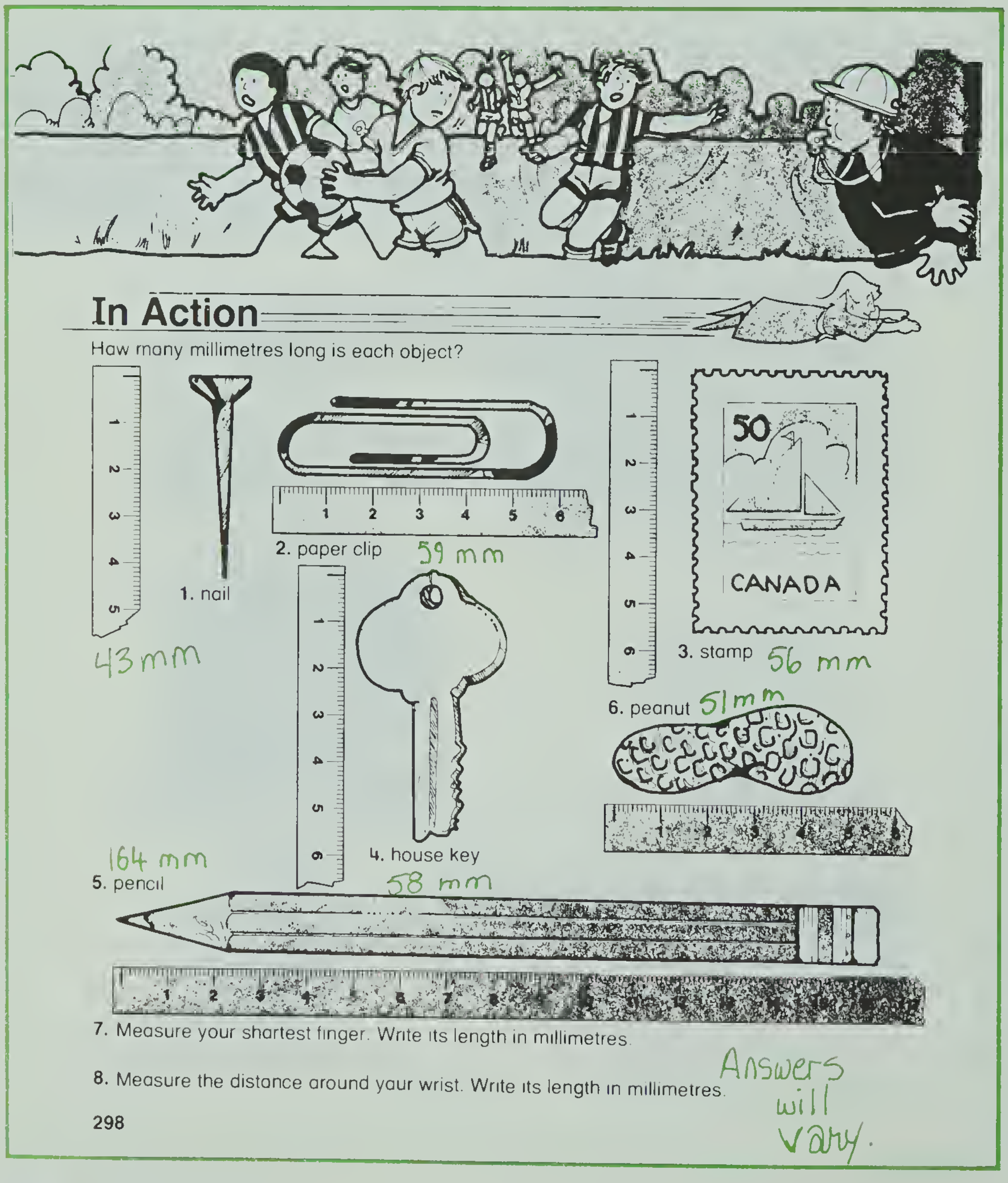
297

4
Have the children estimate the length of an object in millimetres and record the estimates. Then have the children measure the objects and record their actual lengths in millimetres. Discuss the estimates, pointing out that they need not be exact to be acceptable. Repeat the activity several times.

5
Have each child make a chart on which to record estimates and measurements for 10 objects.

Object	Estimate in millimetres	Measurement in millimetres

Recall with the children that they should record each measurement before making the next estimate, so that they can apply the experience to following estimates. Discuss the activity, inviting each child to tell about the estimated and actual length of one or two objects. Display the charts in the classroom.



In Action

How many millimetres long is each object?

1. nail 43mm
2. paper clip 59 mm
3. stamp 56 mm
4. house key 58 mm
5. pencil 164 mm
6. peanut 51 mm
7. Measure your shortest finger. Write its length in millimetres.
8. Measure the distance around your wrist. Write its length in millimetres.

Answers will vary.

298

Written and Other Activities

☐

mathways 3, pages 297, 298
Discuss the illustrations and information on page 297 in relation to objects measured in millimetres during the lesson. Have the children check the length of each object illustrated by measuring with their rulers. Assign the In Action activity, reminding the children to use the symbol mm when recording estimates and measurements.

☐ ☐

Give each child an assignment such as the following, varying the number of millimetres:

Find three objects at home that you believe to be about 12 mm long. Measure to find out if your estimate is correct. Be prepared to tell the class the name of these objects.

Have the children report the following day, stating the measurement and telling about other objects measured before finding three close enough to the assigned number of millimetres.

Unit 4 Section 3 Lesson 4

PROBLEM SOLVING

Solving Word Problems: Millimetres

Materials

- for each child
  - ruler marked in millimetres

Lesson

1

Gather the children around the working area and distribute the rulers. Begin the lesson with a review of the relationship between millimetres and centimetres, asking children

How many millimetres are in 1 cm*? 5* cm*? 10* cm*? 2* cm*?*

Encourage the children to look at their rulers to check these lengths. Then, have them put their rulers aside and draw lines estimated to be 5 mm, 10 mm, 30 mm, 2 mm, 15 mm, 50 mm, . . ., long. Have each child measure the lines drawn to check the estimates, then draw the lengths again, this time with a ruler. Repeat the activity, so that the children can experience an improvement in their ability to estimate.

2

Pair the children. Instruct them to measure each other. Give them suggestions, such as

How many millimetres long is your partner's hand? thumb? thumbnail? eyebrow? ear? nose?

Have these measurements recorded. A simple chart could be devised, for example

	Thumb	Hand	nose
Mary			
Paul			

When the task is finished, gather the children together for a discussion. Were there any surprises? Whose hand, thumb, nose, etc., is longest? Whose is shortest? How many millimetres longer is the longest nose, compared to the shortest? About how many centimetres long is each nose? Which unit produces the most accurate measure?

Written and Other Activities

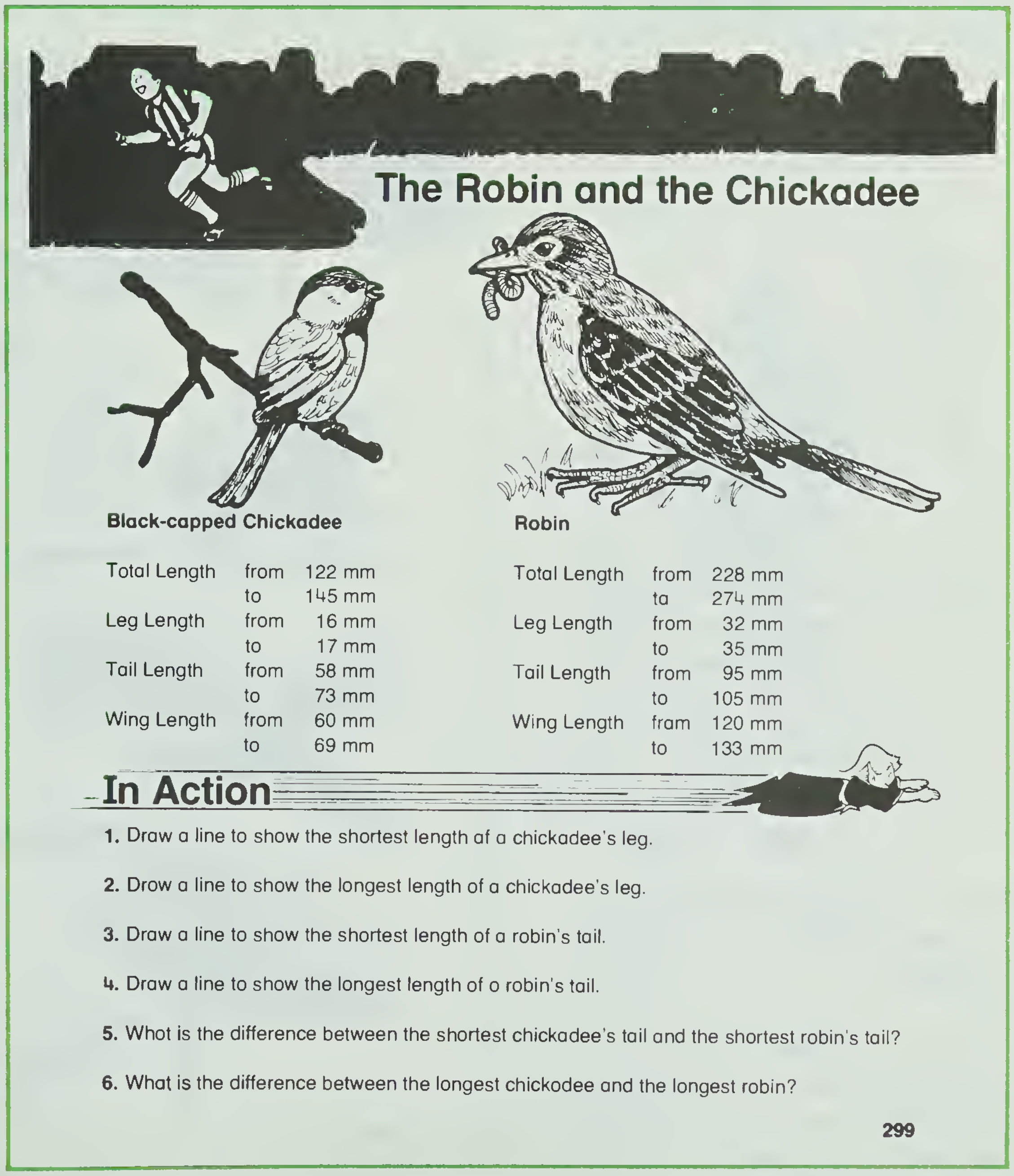
☐

mathways 3, page 299

Discuss the information on the page. Discuss the reason for recording such accurate measurements for types of birds. Who would find this information useful? Why?

☐ ☐

Have groups of children research the length of other bird's or animal's body parts. Each group could be assigned an animal and the assistance of the librarian sought to help the children find the information they need. Some information might be the result of measurements taken by the children. For example they might measure their pets. Instruct the children to present their information in chart form so that it can be displayed in the classroom. These charts can be used for discussions comparing the lengths of animal body parts, including those of the children. They are also useful for making up word problems involving length in millimetres.



The Robin and the Chickadee

Black-capped Chickadee

Total Length	from	122 mm
	to	145 mm
Leg Length	from	16 mm
	to	17 mm
Tail Length	from	58 mm
	to	73 mm
Wing Length	from	60 mm
	to	69 mm

Robin

Total Length	from	228 mm
	to	274 mm
Leg Length	from	32 mm
	to	35 mm
Tail Length	from	95 mm
	to	105 mm
Wing Length	from	120 mm
	to	133 mm

In Action

1. Draw a line to show the shortest length of a chickadee's leg.
2. Draw a line to show the longest length of a chickadee's leg.
3. Draw a line to show the shortest length of a robin's tail.
4. Draw a line to show the longest length of a robin's tail.
5. What is the difference between the shortest chickadee's tail and the shortest robin's tail?
6. What is the difference between the longest chickadee and the longest robin?

Unit 4 Section 4 Lesson 1

Exploring Slides

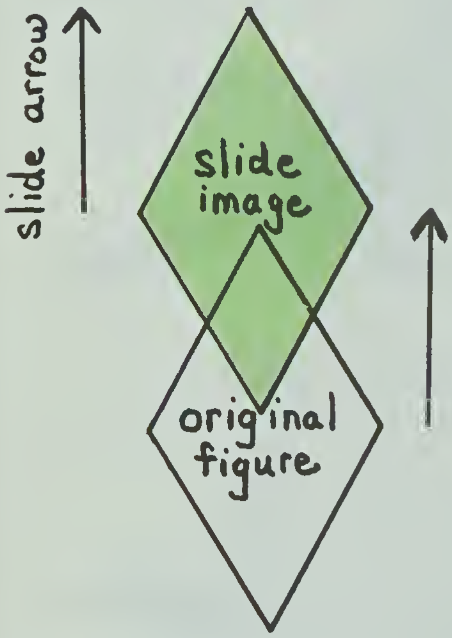
Materials

- magazines and catalogues
- samples of wallpaper or wrapping paper
- for each child
  - tracing paper
  - pair of scissors
  - a copy of Program Master 34
  - copy of stencil, *see* ☐ ☐

Rationale

Sliding or flipping a figure, then tracing it to create a slide image, shows children that changes in position or angle of orientation of a figure do not affect size or shape.

The method used to create a slide image will be to trace a figure and slide arrow, slide the tracing in the indicated direction till the end of the traced arrow abuts the tip of the original arrow, then trace the figure again. The arrow shows the distance and direction of the slide.



Note that the resulting images may or may not overlap.

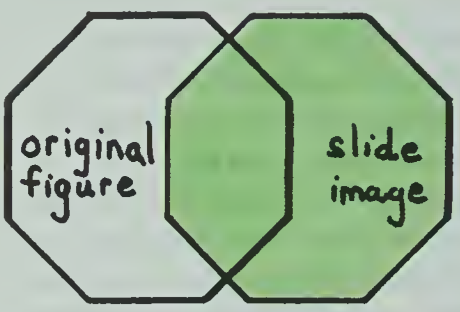
Lesson

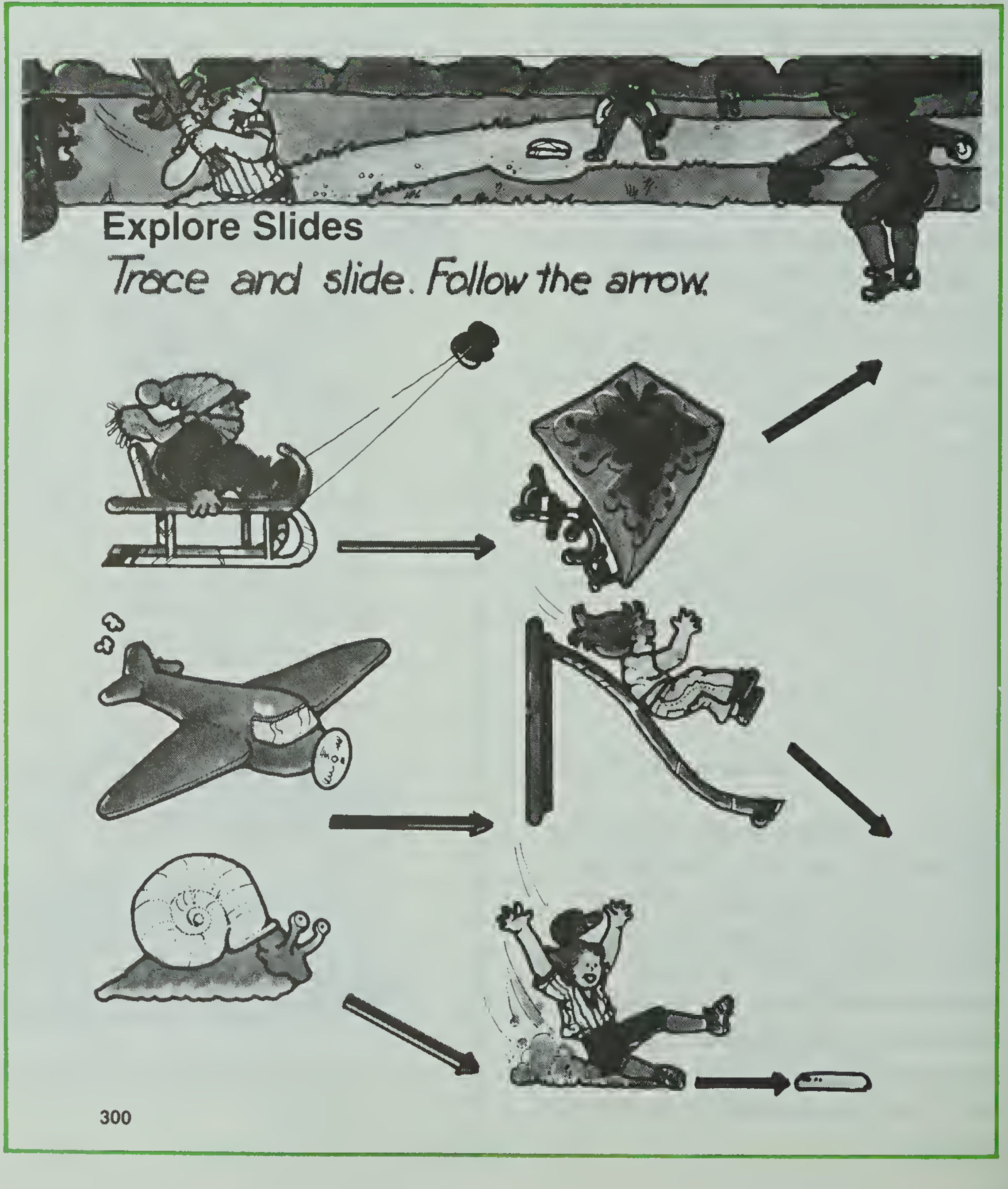
1

Gather the children around the working area and initiate a discussion of sliding. What kinds of things slide and under what conditions? Children will enjoy relating experiences they have had while skating, tobogganing, using a slide at a nearby playground or park, and so on. They may mention sliding doors and windows, or objects moved along a counter top. After each child has had an opportunity to suggest an example or relate an anecdote, note that sliding objects or persons are not changed by the motion; only their positions change.

2

Provide the children with one of the polygons cut from Program Master 34. Have the children slide and trace the figure to create a pattern. Discuss with the children that the direction of the slide may be horizontal, vertical or diagonal. Some children may choose to slide the chosen figure in one direction only; others may slide it in different directions. The following example shows one possibility, but the children may choose not to have their figures touching:





Explore Slides

Trace and slide. Follow the arrow.

300

3
Have the children cut pictures from magazines and catalogues, then slide and trace them to create a pattern.

4
The children may enjoy cutting pictures from magazines and catalogues to create a classroom display of people or objects sliding. Use the pictures in the display to initiate discussion and to encourage the children to notice other examples of sliding in their environment. The children can draw pictures of these examples and add them to the classroom display over a period of several days.

Written and Other Activities

☐

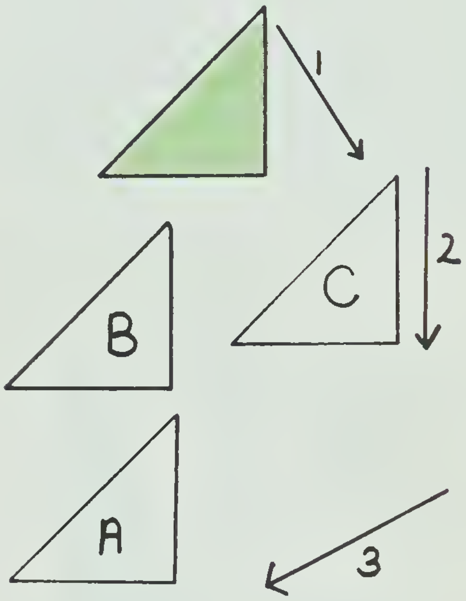
mathways 3, pages 300, 301
Provide the children with tracing paper. Be prepared to assist individuals who have difficulty sliding the tracings along the arrows without lifting or turning them.

☐ ☐

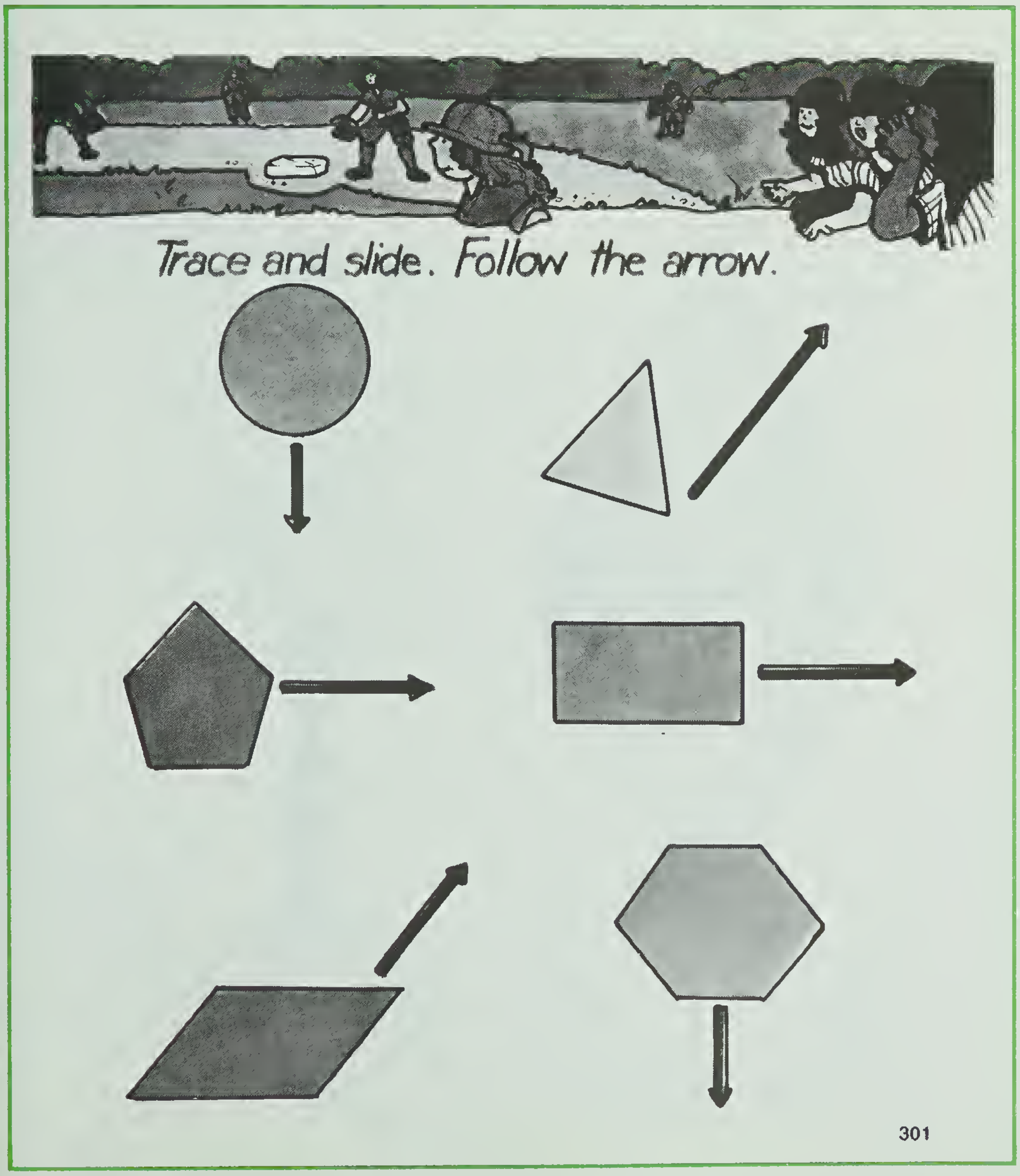
Prepare a stencil of figures, such as those shown on *mathways 3* page 301, and slide arrows of various lengths. Give each child a copy of the stencil and a supply of tracing paper.
The children trace and slide as indicated, then mark on the tracing paper the vertices of the original figure by pressing down with the point of a pencil. They remove the tracing paper and join the points to create the slide image. To be sure that the children understand the task, demonstrate on the easel.

☐ ☐ ☐

Prepare several activity cards in the following manner: On a card draw and shade in a figure. Draw three more figures and letter them *A, B, C.* Draw three slide arrows, numbering them 1, 2, 3, respectively.



Instruct the children to trace the shaded figure and arrow 1, then slide the tracing in the indicated direction and trace arrow 2, slide, trace arrow 3 and slide again to find out whether the final position of the figure corresponds with figure A, B or C.
Often wallpaper and wrapping paper patterns are created by sliding a picture or geometric figure. Provide samples, and have the children search for examples of sliding.


Trace and slide. Follow the arrow.

301

Unit 4 Section 4 Lesson 2

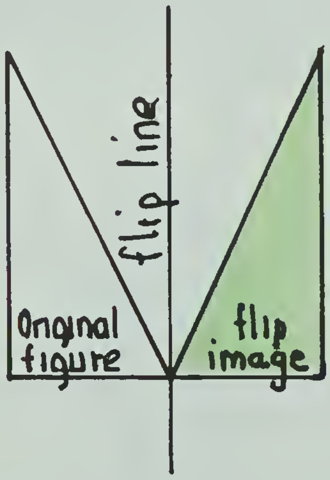
Exploring Flips

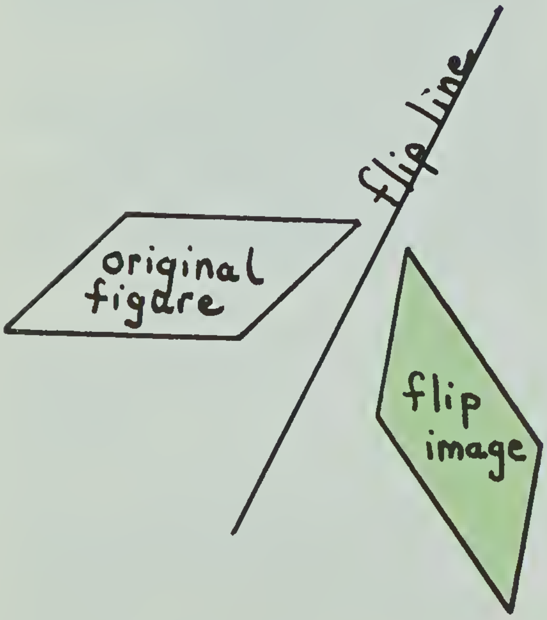
Materials

- wrapping paper and wallpaper samples
- for each child
  - – old catalogues or magazines
  - – a copy of Program Master 34
  - – copy of stencil, *see* ☐ ☐

Rationale

When a figure is flipped, it retains its original shape and size. A figure is flipped about a flip line. The figure, the flip line, and the flip image form a symmetrical picture with the flip line as a line of symmetry. The method of flipping is to trace the figure and the flip line and then flip the tracing so that the tracing of the flip line is placed on the original flip line and the tracing of the shape is placed on the other side of the flip line.





Lesson

1

Ask the children where they have seen objects flipped from one side to the other. They may think of the cover of a book being opened or closed, the lid on a suitcase being opened or closed, some doors, or a mat being turned over. Then ask them to name things that look as though one side has been flipped about a line to form the other side. Some examples are faces, leaves, or any symmetrical objects.

2

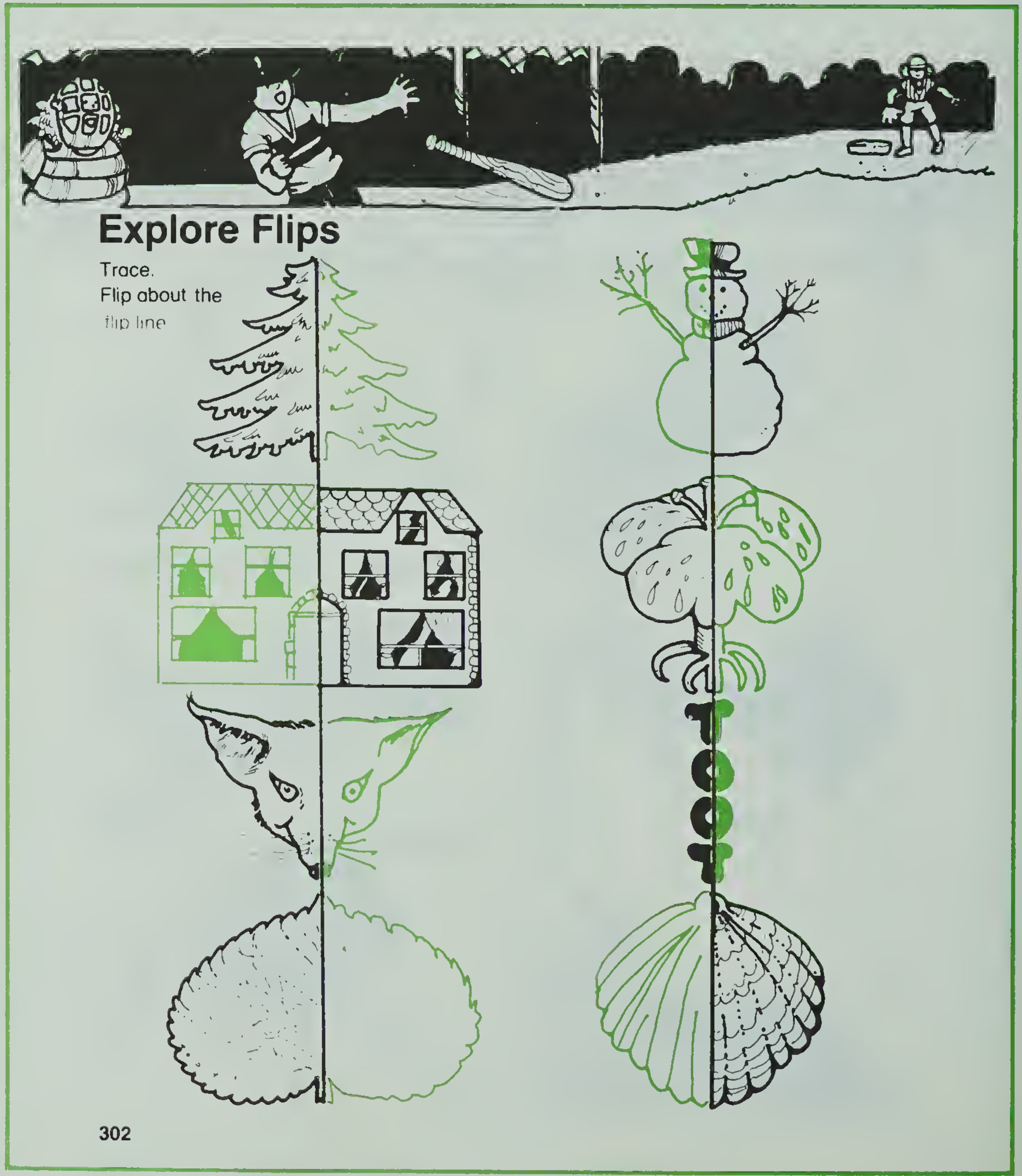
Have each of the children find and cut a figure from a catalogue or magazine. Have them trace the figure, flip it and trace it again and continue flipping and tracing to form a pattern.

3

Provide each of the children with one of the polygons cut from Program Master 34. Have the children create a flip pattern by tracing the figure, flipping and tracing it a number of times.

4

Often wallpaper and wrapping paper patterns are created by flipping a picture or geometric figure. Have the children examine wallpaper and wrapping paper samples to find examples of flips.



Explore Flips

Trace.
Flip about the flip line

302

Written and Other Activities

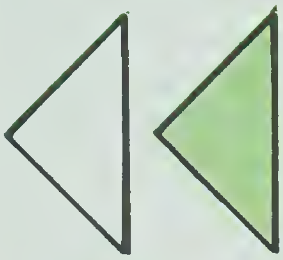
☐

mathways 3, pages 302, 303
Provide the children with tracing paper.

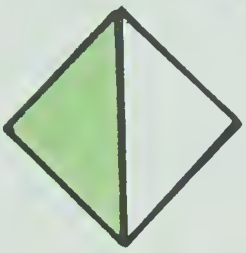
☐ ☐

To have the children distinguish between slides and flips, prepare a stencil with pictures such as these. For each exercise, the children write whether a slide or a flip was used to move the figure to the shaded position.

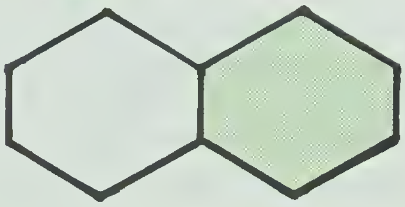
1.

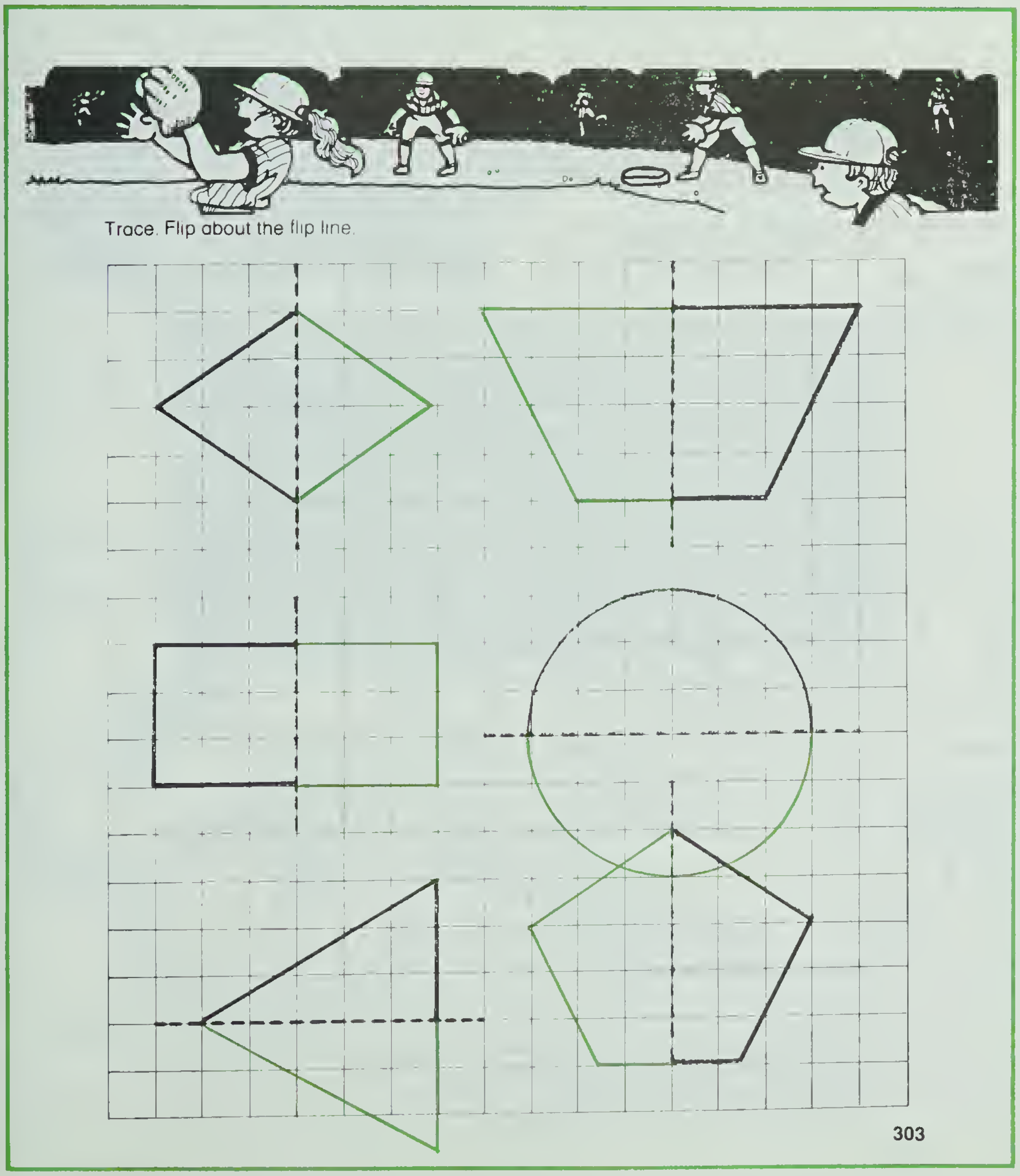


2.



3.





Trace. Flip about the flip line.

303

For Your Notes

Unit 4 Section 4 Lesson 3

Solving Word Problems: Adding and Subtracting Amounts of Money

Materials

- catalogues, magazines and newspapers
- price tags
- rectangular pieces of Bristol board for making sale signs
- stencil, *see* ☐ ☐ ☐

Lesson

1

Seat the children around the working area for a discussion of sales. Encourage the children to talk about their own and family experiences. What objects have they or their parents purchased at reduced prices? What were the original prices of these items? Perhaps the children are waiting for certain items to go on sale. At what times of the year are sales most likely to occur? How much money do the children think they can save by waiting for a sale of the desired items? When all the children have had an opportunity to contribute to the discussion, pose word problems based on the information they have given. For example

If a baseball that usually costs $6 goes on sale for $4, how much money can you save, Sean?

Catherine, if the cost of your favourite jeans is $22 before school starts in September, and falls to $18 after Christmas, how much money can your family save by waiting for the sale?

In each case, ask the children how they found the difference between the original price and the sale price, and discuss what other items can be purchased with the money saved.

2

Divide the class into groups of four or five. Have each group make several price tags. Give each group a catalogue and some magazines. Ask the children to cut out pictures of objects they would like to buy for themselves or for family members and friends. Have the children write a price on a tag and attach one to each item. When the task is finished, write on the blackboard

SALE! $1.49 off everything in the store!

Have the children stroke out the original price on the tags, then calculate and write the sale price underneath.

3

Have the children in each group use repeated addition to find out how much money was saved by the whole group.

Written and Other Activities

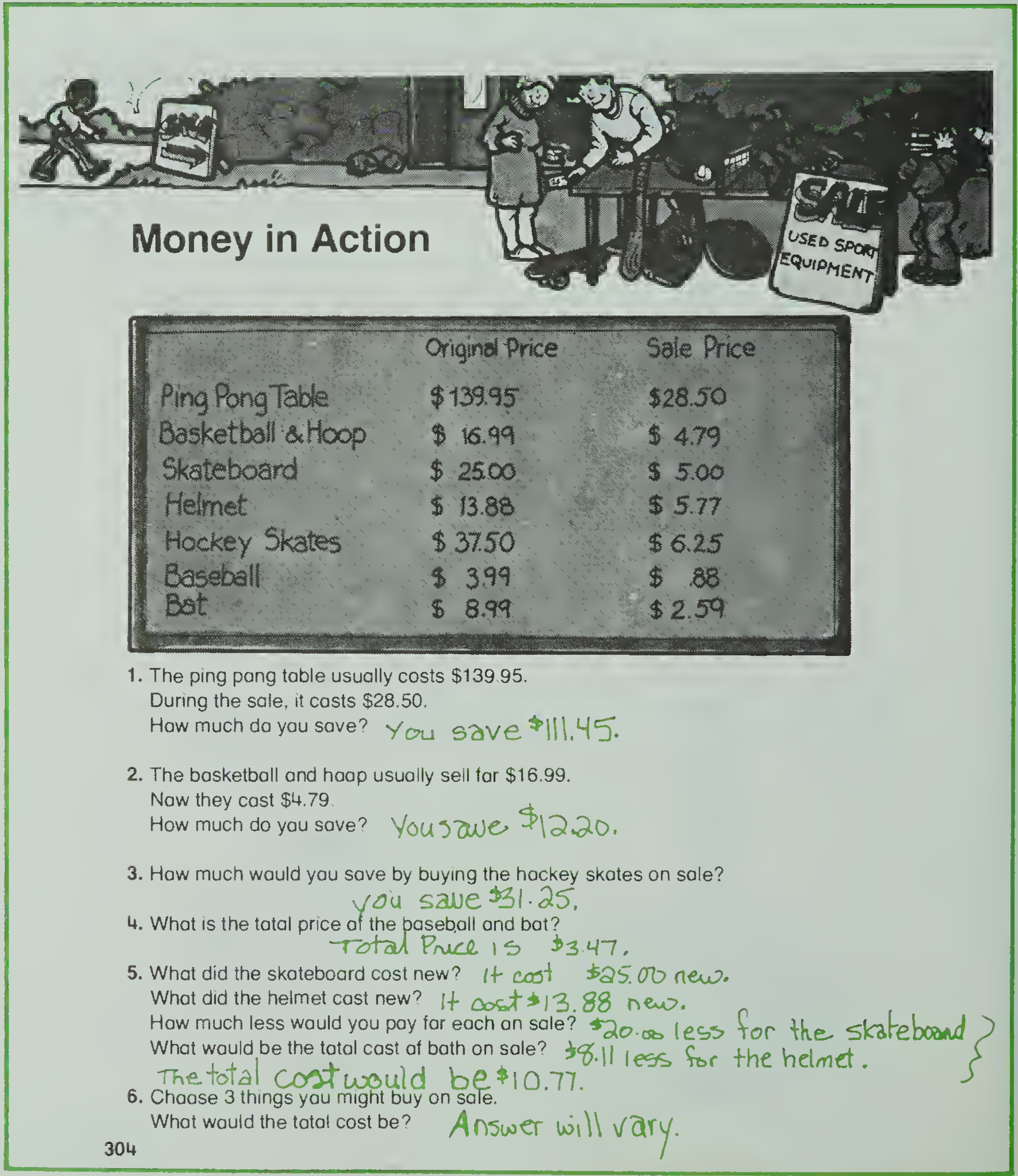
☐

mathways 3, page 304

Discuss the items listed for sale, and the original and reduced price of each item. Some of the prices reflect amounts greater than the children have worked with. Because of the time of year, this should not present any particular difficulty. Have different children read the problems aloud and tell how they will find the answers.

☐ ☐

Have the children remove the price tags from the items cut out for activity 3. Then, working together, the children sort the pictures into categories — clothing, toys, sporting goods, jewelry, and so on — and set up a department store in the activity centre. The children form groups again and each group is put in charge of a department. The groups attach new price tags showing a sale price for the items, and make a sale sign giving


SALE
USED SPORT EQUIPMENT

Money in Action

	Original Price	Sale Price
Ping Pong Table	$139.95	$28.50
Basketball & Hoop	$ 16.99	$ 4.79
Skateboard	$ 25.00	$ 5.00
Helmet	$ 13.88	$ 5.77
Hockey Skates	$ 37.50	$ 6.25
Baseball	$ 3.99	$ .88
Bat	$ 8.99	$ 2.59

1. The ping pong table usually costs $139.95.
During the sale, it costs $28.50.
How much do you save? You save $111.45.

2. The basketball and hoop usually sell for $16.99.
Now they cost $4.79.
How much do you save? You save $12.20.

3. How much would you save by buying the hockey skates on sale?
you save $31.25.

4. What is the total price of the baseball and bat?
Total Price is $3.47.

5. What did the skateboard cost new? It cost $25.00 new.
What did the helmet cost new? It cost $13.88 new.
How much less would you pay for each on sale? $20.00 less for the skateboard
What would be the total cost of both on sale? $8.11 less for the helmet.
The total cost would be $10.77.

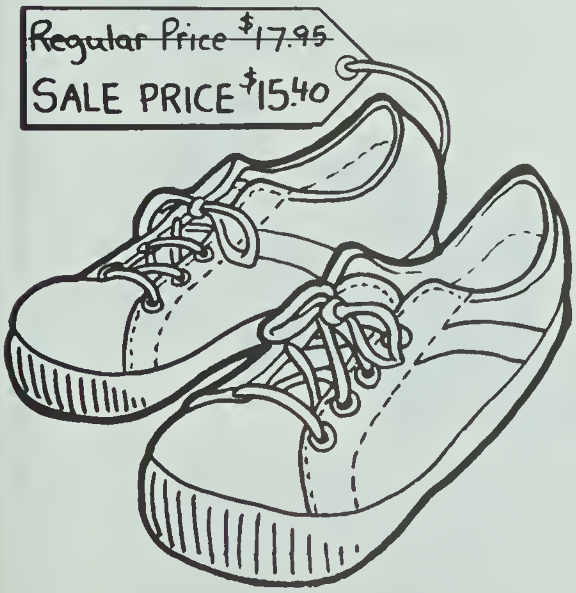
6. Choose 3 things you might buy on sale.
What would the total cost be? Answer will vary.

304

the amount of the reduction. For example
All jewelry now $3.49 less than the original price!
The department store workers then become individual shoppers. Each child selects a number of items to buy and makes a list giving the sale price and the amount of the reduction. The child finds and records the original price of each item, then adds up all the original prices and all the reduced prices, and subtracts the totals to discover how much money was saved overall. The shopper then selects another item to buy with the money saved. Discuss the activity, calling on children to tell what they bought, the original and sale prices, how much they saved, what they bought with their savings, whether any money was left over, and so on. Then ask the children if they can suggest another way of finding the total amount of the savings (repeated addition of the amount of the reduction).

☐ ☐ ☐

Ask each of the children to bring a sale catalogue to class. Have each child find and cut from the catalogue several interesting items for which both the regular price and the sale price are given.


~~Regular Price $17.95~~
SALE PRICE $15.40

Have the children calculate the savings for several of the items.

☐ ☐ ☐ ☐

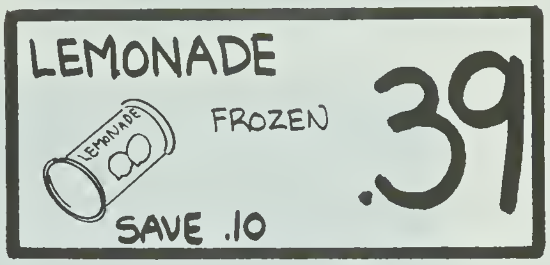
Make a stencil containing items which are on sale.

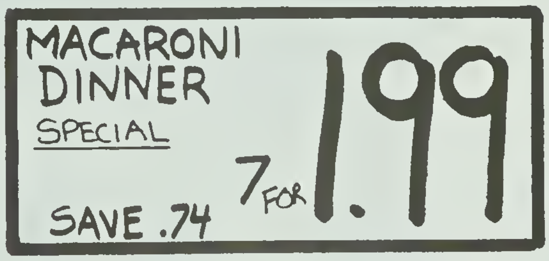
Sale Price	Savings	Regular Price
1. $7.95	$1.20	
2. $15.00	$10.95	
3. $29.95	$5.00	
4. $38.50	$1.75	
5. $13.70	$2.25	
6.		

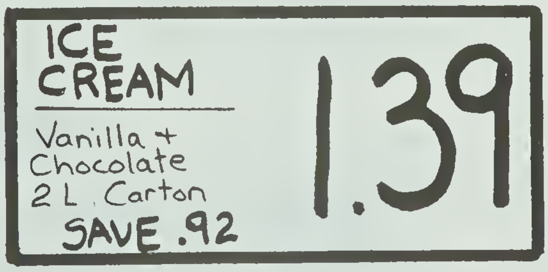
Duplicate it and have the children complete the chart.

☐ ☐ ☐ ☐ ☐

Ask the children to find and cut from old newspapers illustrations of food items which were being sold at sale prices.


LEMONADE
LEMONADE
FROZEN
.39
SAVE .10

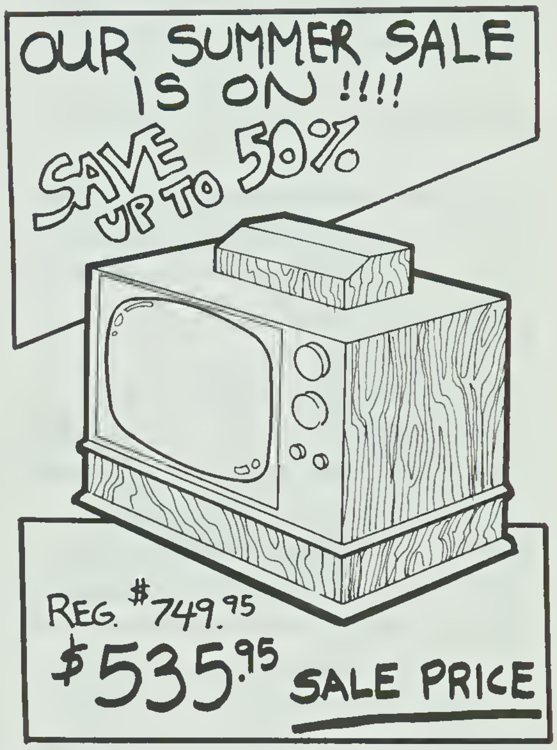

MACARONI DINNER
SPECIAL
7 FOR 1.99
SAVE .74


ICE CREAM
Vanilla + Chocolate
2 L Carton
SAVE .92
1.39

If only the sale price is given, have the children find the regular price by talking to an adult or actually visiting a grocery store.

☐ ☐ ☐ ☐ ☐ ☐

Ask each child to interview an adult at home to determine when that adult last purchased something on sale. Have the child discover the regular price, the amount of the reduction and the sale price.


OUR SUMMER SALE IS ON !!!!
SAVE UP TO 50%
REG. $749.95
$535.95
SALE PRICE

Unit 4 Section 4 Lesson 4

Making Change

Materials

- catalogues
- blank cards
- for each child
  - play money: $1, $2, $5 reproduced from Program Master 14
  - coins reproduced from Program Masters 8 to 13

Lesson

1

Invite the children into the working area for a game of *Let's Pretend.*

Let's pretend this is a restaurant and make up a menu listing all our favourite foods.

What's your favourite food, Jim?

As each child responds to the question, list the item and a price on the easel. When the menu is complete, ask children to suggest names for the restaurant and, when a consensus has been reached, write the name above the menu. Then, give each child an amount of play money consisting of one-dollar, two-dollar and five-dollar bills.

To begin the game, take the role of the restaurant keeper. A child orders a meal or snack and offers a bill in payment. Discuss with the children the appropriate amount of change, and have a child count aloud from the price:

Fifty-five, sixty-five, seventy-five, one dollar.

When the example has been well established, pair the children and have them alternate roles of the restaurant keeper who counts out change and the customer who purchases and pays for a food item.

2

Have the children cut out several favourite objects from old catalogues. It might be wise to reach a consensus on the upper limit of prices. $10.00 might be a realistic figure. Have the catalogue pictures assembled in the centre of the working area. In turn have the children select an item, and "pay" for it with the correct number of bills. Have different children count the change back to the customer.

3

To demonstrate that subtraction, rather than counting, can be used to find the amount of change and the denominations, pose word problems based on the menu on the easel.

Carla, if you bought a milkshake for sixty cents and paid with three quarters, how much money would you receive in exchange?

What coins would the cashier give you in return for seventy-five cents?

Write on the easel

$$\begin{array}{r} 75¢ \\ -60¢ \\ \hline 15¢ \end{array}$$

Discuss the coins that could be used for the change: the number of pennies, the number of nickels, the number of dimes and nickels or pennies, and so on.

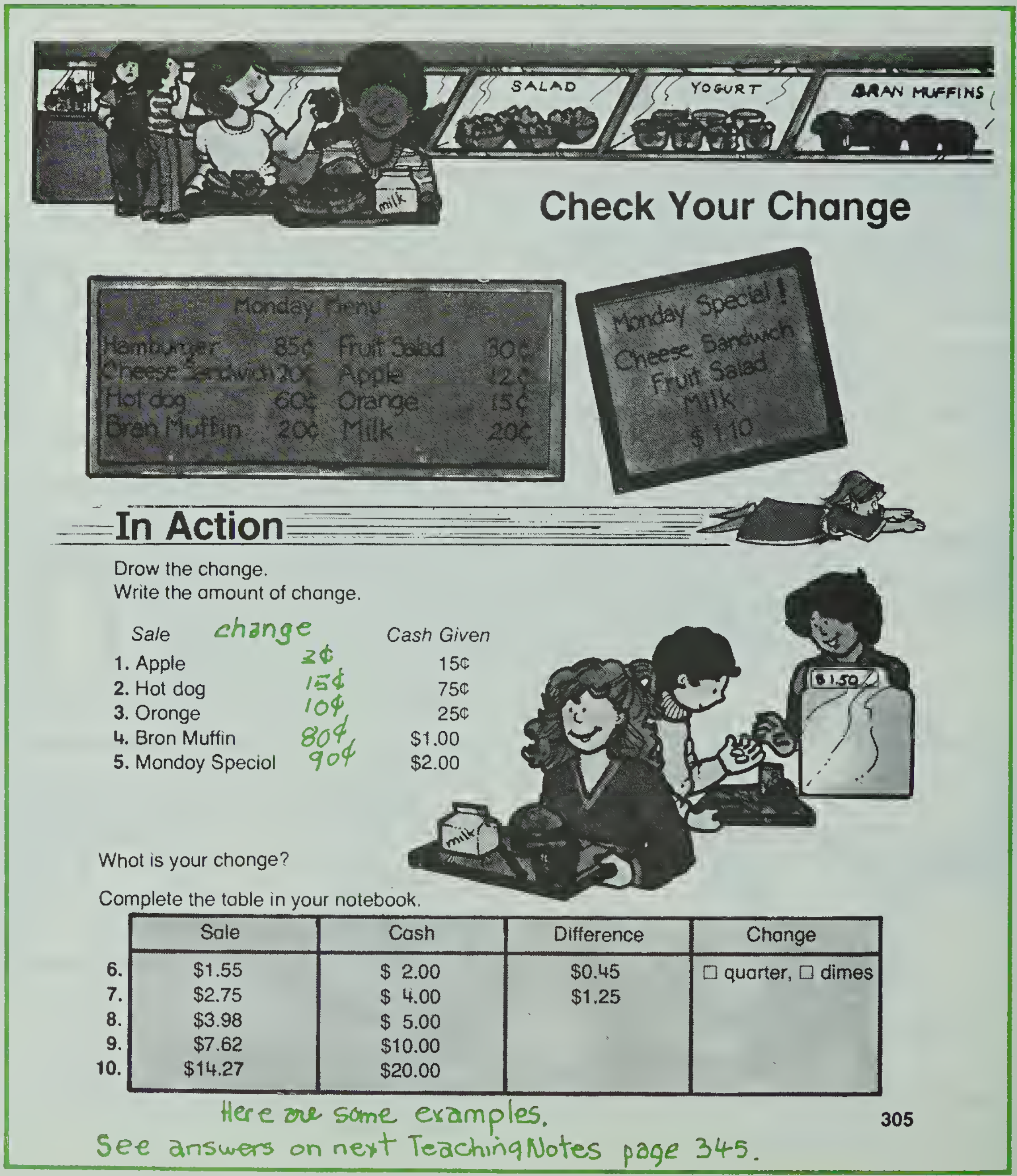
4

Give each child one dollar in change to add to their bills, and change the game to

Let's pretend we're ordering things from this catalogue.

Have each child in the group select an item to buy and give the exact amount in bills and coins in payment.

As well, have the children demonstrate the counting or procedure as was established in activity 1.



Check Your Change

Monday Menu

Hamburger	85¢	Fruit Salad	30¢
Cheese Sandwich	20¢	Apple	12¢
Hot dog	60¢	Orange	15¢
Bran Muffin	20¢	Milk	20¢

Monday Special!
Cheese Sandwich
Fruit Salad
Milk
$ 1.10

In Action

Draw the change.
Write the amount of change.

Sale	change	Cash Given
1. Apple	3¢	15¢
2. Hot dog	15¢	75¢
3. Orange	10¢	25¢
4. Bran Muffin	80¢	$1.00
5. Monday Special	90¢	$2.00

What is your change?

Complete the table in your notebook.

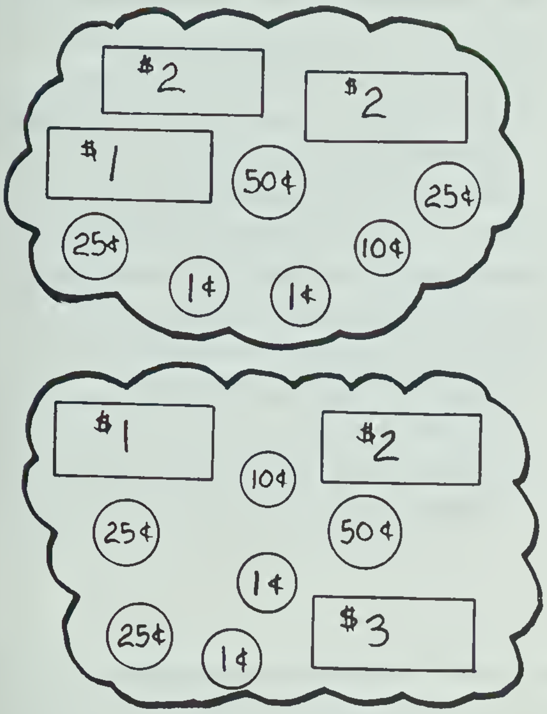
	Sale	Cash	Difference	Change
6.	$1.55	$ 2.00	$0.45	☐ quarter, ☐ dimes
7.	$2.75	$ 4.00	$1.25	
8.	$3.98	$ 5.00		
9.	$7.62	$10.00		
10.	$14.27	$20.00		

Here are some examples.
See answers on next Teaching Notes page 345.

305

5

Show two amounts of money.



Ask

Which of these two amounts of money is greater, Anna?

Repeat the activity several times, giving each child an opportunity to present the two amounts while the others count to check.

Written and Other Activities

☐

mathways 3, page 305

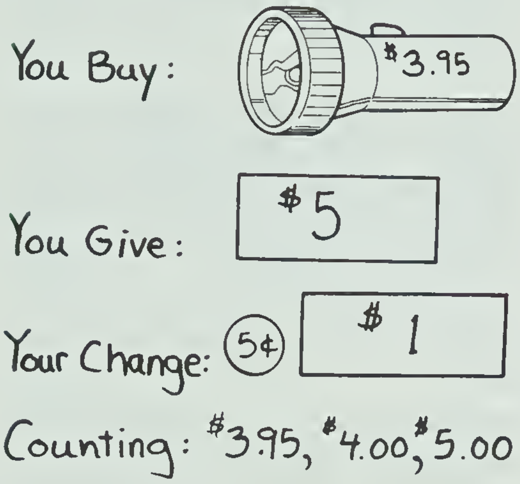
☐ ☐

Have the children work in small groups to make up and solve problems similar to those on *mathways 3* page 305. The groups may use the menu provided or make up and decorate menus of their own. One child asks a question based on the menu, and the other children answer the question by drawing the bills and coins that would be given for change.

Alternatively, have the children use the menus for role play. Each group is given play money. The children take turns being the waiter. The customers select meals and give bills in payment, and the waiter counts out the change.

☐ ☐ ☐

Using catalogue illustrations, have the children make activity cards for the activity centre. For example



Additional Answers

mathways 3, page 305

6. Change: 1 quarter, 2 dimes
7. Change: 1 dollar, 1 quarter
8. Difference: $1.02
   Change: 1 dollar, 2 pennies
9. Difference: $2.38
   Change: 2 dollars, 1 quarter, 1 dime, 3 pennies
10. Difference: $5.73
   Change: 5 dollars, 2 quarters, 2 dimes, 3 pennies

For Your Notes

Section 5 Lesson 1

Multiplying by 10

Materials

- 18 dimes
- 1 dollar bill
- old catalogues

Rationale

This lesson takes advantage of the fact that Canadian currency is fundamentally a base 10 system of numeration. Using money as the theme for introducing multiplication by 10 provides the children with an interesting context for learning a skill that can be easily applied in other contexts.

Lesson

1

Gather the children around a table in the working area. Place a dime on the table.

Gordon, how many dimes are on the table?

How many cents is that?

Record on the easel

1 dime makes 10¢

1 × 10 = 10

Place four dimes on the table.

Astra, how many dimes are there?

How much money is that? Count by tens, please, to find out.

Record on the easel

4 dimes make 40¢

4 × 10 = 40

Continue in this fashion until the children have counted nine dimes.

Take all the dimes off the table and write on the easel

0 dimes makes 0 cents

0 × 10 = 0

2

Show 10 dimes. Have a child count the dimes, then count by tens to find out the number of cents.

Record on the easel

10 dimes make 100¢

10 × 10 = 100

Ask

Pamela, how many dimes will you give me for one dollar?

Replace the dimes with a one-dollar bill.

How many cents are there in one dollar?

Write on the easel

100¢ $1.00 $1

Explain that each expression means the same thing.

3

Place 13 dimes on the table. Have a child count the number of dimes and then count by ten to find the number of cents. Record on the easel

13 dimes make 130¢

13 × 10 = 130

Exchange 10 dimes for a one-dollar bill.

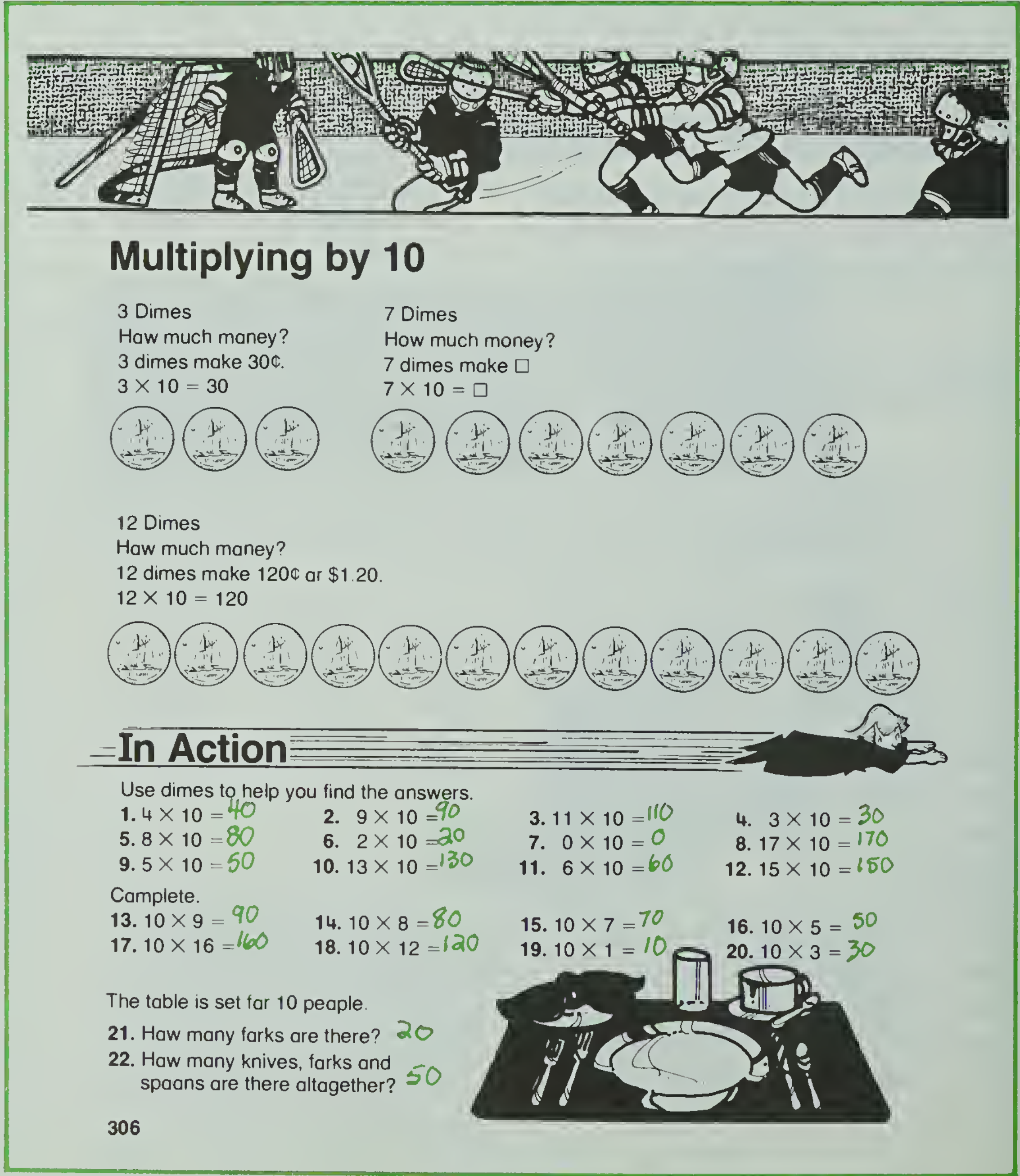
Geraldine, how shall I write one dollar and thirty cents?

Write *$1.30* on the easel, discussing that the expression is another way of representing 130¢ and means the same amount of money.

Continue in this fashion, this time inviting children to record the amounts and multiplication sentences.

Following the demonstration for 18 dimes, or $1.80, have the children examine the multiplication sentences and describe in their own words the patterns they see. Out of this discussion, develop a rule for multiplying by 10.

Write zero after the number being multiplied by 10.



Multiplying by 10

3 Dimes
How much money?
3 dimes make 30¢.
3 × 10 = 30

7 Dimes
How much money?
7 dimes make ☐
7 × 10 = ☐

12 Dimes
How much money?
12 dimes make 120¢ or $1.20.
12 × 10 = 120

In Action

Use dimes to help you find the answers.

1. 4 × 10 = 40
2. 9 × 10 = 90
3. 11 × 10 = 110
4. 3 × 10 = 30
5. 8 × 10 = 80
6. 2 × 10 = 20
7. 0 × 10 = 0
8. 17 × 10 = 170
9. 5 × 10 = 50
10. 13 × 10 = 130
11. 6 × 10 = 60
12. 15 × 10 = 150

Complete.

13. 10 × 9 = 90
14. 10 × 8 = 80
15. 10 × 7 = 70
16. 10 × 5 = 50
17. 10 × 16 = 160
18. 10 × 12 = 120
19. 10 × 1 = 10
20. 10 × 3 = 30

The table is set for 10 people.

21. How many forks are there? 20
22. How many knives, forks and spoons are there altogether? 50

306

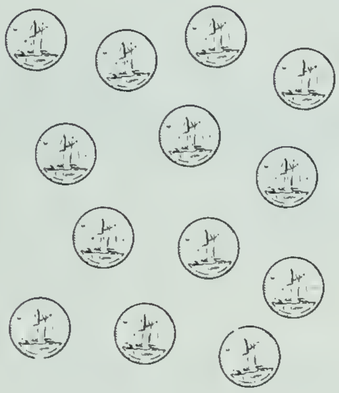
Written and Other Activities

☐

mathways 3, page 306

☐ ☐

Have the children illustrate several of the multiplication sentences on text page 306 by drawing dimes, then labelling the picture with the equivalent expression for cents. Recall with the children that if the product is more than 90¢, the amount must be recorded in the form of dollars and cents as well. For example, after drawing coins to show the sentence 13 × 10 = 130, the child records
13 dimes make 130¢ or $1.30



☐ ☐ ☐

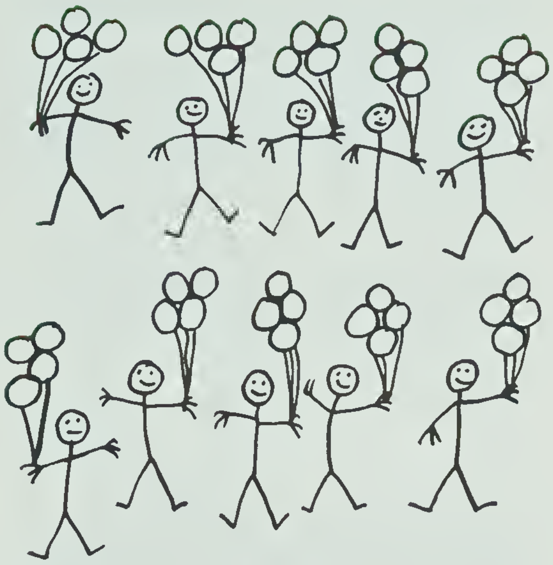
Have the children count by tens from 0 to 200, then back to 0.

☐ ☐ ☐ ☐

For practice, state 10 multiplication expressions and have the children record only the products.

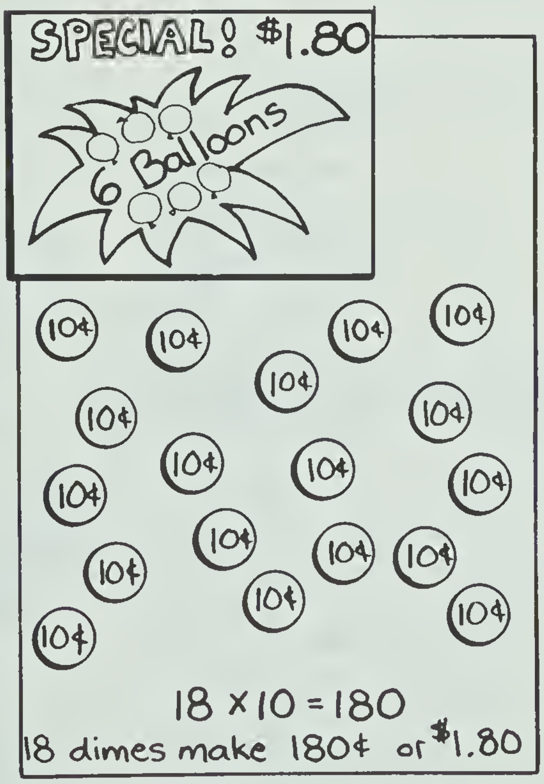
☐ ☐ ☐ ☐ ☐

Have each child write a multiplication problem involving a multiple of 10 on a sheet of paper. The problems might involve amounts of money, or they might reflect other familiar settings. For example
10 people came to my birthday party.
Each person brought 4 balloons.
How many balloons did I get?
The children exchange papers and draw and colour a picture to illustrate the problem, then record the answer in a sentence. Display the picture-problems in the classroom.



☐ ☐ ☐ ☐ ☐ ☐

Ask each child to find and cut from old catalogues illustrations of items which cost less than $2.00. Have the children change the last digit of each price to 0. For example, $1.52 would be changed to $1.50, and $1.29 to $1.20. Show several examples of this on the easel. Then ask each child to draw the appropriate number of dimes required to pay for the item and to record the related multiplication sentence under it.



For Your Notes

Unit 4 Section 5 Lesson 2

Multiplying by 10: Converting Centimetres to Millimetres

Materials

- for each child
  - ruler marked in centimetres and millimetres
  - copy of stencil, *see* **4**

Lesson

1

Gather the children around the working area and give each child a ruler. Review the relation between centimetres and millimetres, asking

How many millimetres are in one centimetre?

Record on the easel

1 × *10* = *10*
1 cm = *10* mm

How many millimetres are in three centimetres?

Record

3 × *10* = *30*
3 cm = *30* mm

Continue in this fashion until the pattern of multiplying by 10 is clear. After the first few examples, have the children each record the sentences.

2

Have children measure objects in the classroom to the nearest centimetre.

Caroline, measure this pencil to find out how many centimetres long it is. Record the number of centimetres on the easel, please.

When the task has been completed, ask

How many millimetres is that?
How do you find the number of millimetres if you know the number of centimetres?

Have all the children count by 10s on their rulers to check the answer.

Repeat the activity several times, giving each child an opportunity to measure an object while all of the others convert the number of centimetres to millimetres.

3

Discuss multiplying by 10, comparing the result of multiplying an amount of money by 10 to multiplying a number of centimetres by 10, and that the pattern is the same in both cases; only the symbols change.

4

Give each child a copy of a stencil such as the following:

0 × *10* = ☐ *10* × *0* = ☐
1 × *10* = ☐ *10* × *1* = ☐
2 × *10* = ☐ *10* × *2* = ☐
3 × *10* = ☐ *10* × *3* = ☐
4 × *10* = ☐ *10* × *4* = ☐
5 × *10* = ☐ *10* × *5* = ☐
⋮ ⋮
19 × *10* = ☐ *10* × *19* = ☐

Have the children complete the sentences. When the task is finished, invite children to describe the pattern in their own words. Discuss the pattern in terms of converting centimetres to millimetres.

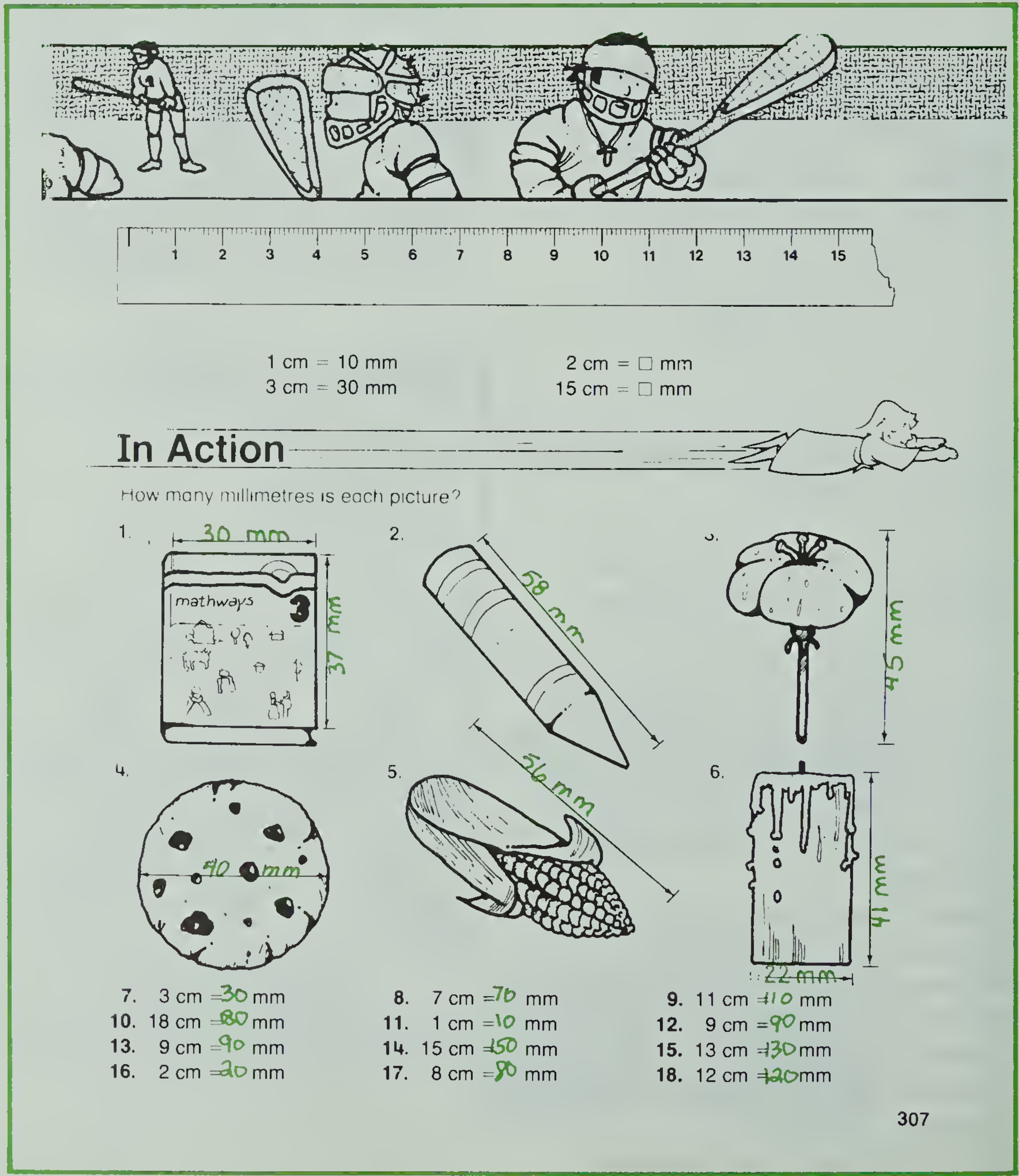
Written and Other Activities

☐

mathways 3, page 307

Discuss the example. Have children describe what they will do to change from centimetres to millimetres. Have children measure the first two illustrations and write multiplication sentences on the easel that show the conversion from one unit to another.

3 × *10* = *30* *3* cm = *30* mm



1 cm = 10 mm
3 cm = 30 mm

2 cm = ☐ mm
15 cm = ☐ mm

In Action

How many millimetres is each picture?

1.
2.
3.
4.
5.
6.

7. 3 cm = 30 mm
8. 7 cm = 70 mm
9. 11 cm = 110 mm
10. 18 cm = 180 mm
11. 1 cm = 10 mm
12. 9 cm = 90 mm
13. 9 cm = 90 mm
14. 15 cm = 150 mm
15. 13 cm = 130 mm
16. 2 cm = 20 mm
17. 8 cm = 80 mm
18. 12 cm = 120 mm

307

Unit 4 Section 5 Lesson 3

Multiplying by Multiples of Ten

Materials

- 10-sticks
- activity cards, *see* ☐ ☐ ☐
- for each child
  - 10-strips reproduced from Program Master 19

Lesson

1

Gather the children around the working area. Recall working with dimes and centimetres. Place seven 10-sticks in the centre of the area, saying

Each of these 10-sticks represents one set of 10.

Record

7 × 10 = 70

Have the children show two 10-sticks and have one record the multiplication sentence on the easel.

2 × 10 = 20

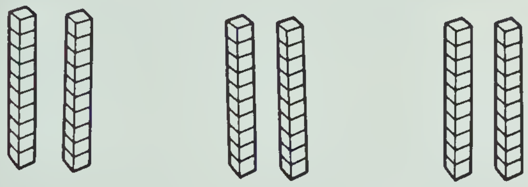
Continue working in this way until the children have good recall.

2 × 10 = 20
5 × 10 = 50
7 × 10 = 70
8 × 10 = 80

Leave the sentences on the easel.

2

Show three sets of two 10-sticks.



How many sets of 10-sticks are there?
A child responds *three sets.*
How many 10-sticks are in each set?
Two 10-sticks.
How many 10-sticks are there altogether?
Six 10-sticks.

Have a child respond

3 × 2 tens = 6 tens

Have the children record

3 × 20 = 60

Have the children in the group show sets of 10-sticks and record the sentences on the easel until the patterns have been established.

3 × 20 = 60
5 × 50 = 250
4 × 70 = 280
6 × 50 = 300

Have the children describe the patterns they see, using their own words.

3

Write a multiplication expression on the easel.

8 × 20 = 160

Have the children illustrate the expression with sets of 10-sticks and record the equivalent sentences.

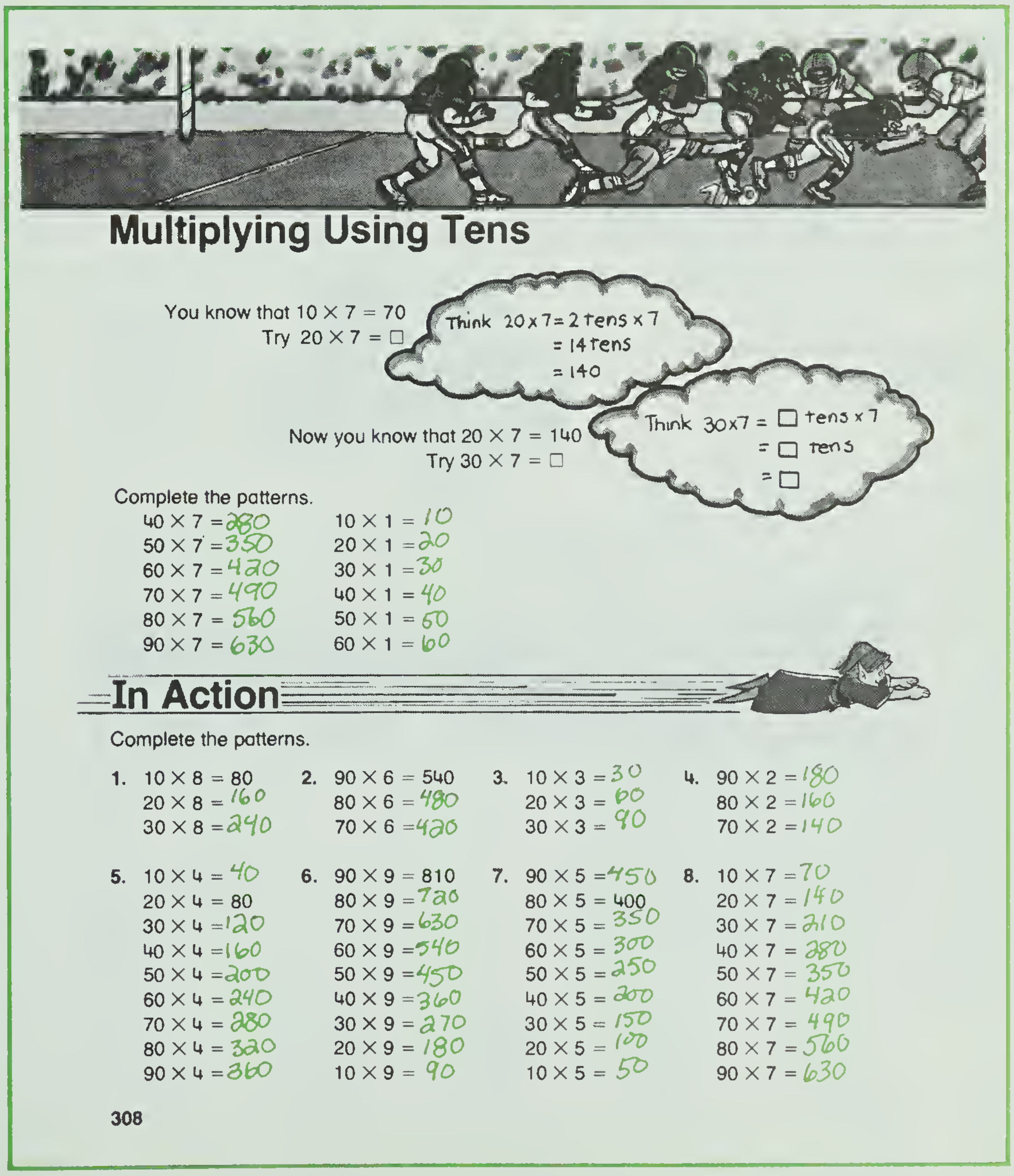
8 × 20 = 160
20 × 8 = 160

Repeat until the children seem to grasp the concept.

3

Write these multiplication expressions on the easel. Have children complete them without using place-value material.

0 × 50 *30 × 6*
1 × 50 *40 × 6*
2 × 50 *50 × 6*
3 × 50 *60 × 6*
4 × 50 *70 × 6*
5 × 50 *80 × 6*
6 × 50 *90 × 6*



Multiplying Using Tens

You know that 10 × 7 = 70
Try 20 × 7 = ☐

Think 20x7 = 2 tens x 7
= 14 tens
= 140

Now you know that 20 × 7 = 140
Try 30 × 7 = ☐

Think 30x7 = ☐ tens x 7
= ☐ tens
= ☐

Complete the patterns.

40 × 7 = 280
50 × 7 = 350
60 × 7 = 420
70 × 7 = 490
80 × 7 = 560
90 × 7 = 630

10 × 1 = 10
20 × 1 = 20
30 × 1 = 30
40 × 1 = 40
50 × 1 = 50
60 × 1 = 60

In Action

Complete the patterns.

1. 10 × 8 = 80
20 × 8 = 160
30 × 8 = 240

2. 90 × 6 = 540
80 × 6 = 480
70 × 6 = 420

3. 10 × 3 = 30
20 × 3 = 60
30 × 3 = 90

4. 90 × 2 = 180
80 × 2 = 160
70 × 2 = 140

5. 10 × 4 = 40
20 × 4 = 80
30 × 4 = 120
40 × 4 = 160
50 × 4 = 200
60 × 4 = 240
70 × 4 = 280
80 × 4 = 320
90 × 4 = 360

6. 90 × 9 = 810
80 × 9 = 720
70 × 9 = 630
60 × 9 = 540
50 × 9 = 450
40 × 9 = 360
30 × 9 = 270
20 × 9 = 180
10 × 9 = 90

7. 90 × 5 = 450
80 × 5 = 400
70 × 5 = 350
60 × 5 = 300
50 × 5 = 250
40 × 5 = 200
30 × 5 = 150
20 × 5 = 100
10 × 5 = 50

8. 10 × 7 = 70
20 × 7 = 140
30 × 7 = 210
40 × 7 = 280
50 × 7 = 350
60 × 7 = 420
70 × 7 = 490
80 × 7 = 560
90 × 7 = 630

308

When the task has been completed, ask the children

What patterns can you find in these multiplication sentences?

Encourage them to mention any pattern they see.

4

Ask the children to prepare for a recall of multiplication facts. State expressions and have the children record only the products. Observe a pattern such as the following:

Seven times six
Ten times forty-two
Eight times six
Ten times forty-eight
Nine times six
Ten times fifty-four

5

Have the children work in small groups or in pairs to practise multiplication facts. Instruct each child to select the facts of a particular number, recorded in his or her notebook during earlier lessons, and use them to quiz the other members of the group. After each quiz, the children multiply the products by 10.

Written and Other Activities

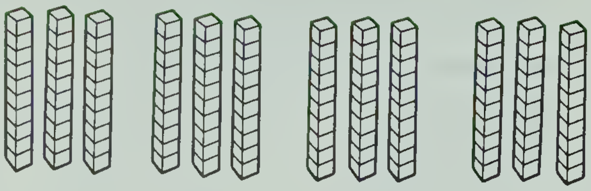
☐

mathways 3, page 308

Before assigning the In Action questions, discuss the examples and invite children to record the products on the easel. Have children describe the patterns they see.

☐ ☐

Provide the children with 10-strips reproduced from Program Master 19. Write a number of multiplication expressions on the easel – for example, 4 × 30. Have the children copy each expression onto a separate sheet of paper, then glue 10-strips on the paper and complete the number sentence.



$4 \times 30 = 120$

☐ ☐ ☐

Prepare activity cards illustrating multiplication by multiples of ten. On each card, draw or glue 10-strips arranged in sets. Number the cards and display them in the activity centre. Each child records the number of a card and writes two multiplication sentences; for example

$9 \times 8 \text{ tens} = 72 \text{ tens}$
$9 \times 80 = 720$

☐ ☐ ☐ ☐

Have the children record number sentences such as the following in their notebooks:

$1 \text{ ten} \times 8 = 8 \text{ tens}$
$2 \text{ tens} \times 8 = 16 \text{ tens}$
$3 \text{ tens} \times 8 = 24 \text{ tens}$

For Your Notes

Unit 4 Section 5 Lesson 4

Multiplying a Two-Digit Number: Expanded Numerals

Materials

- for each child
  - place-value material and mat as illustrated

Lesson

1

Seat the children around the working area. Begin with a review of the relation between multiplication and repeated addition. Write on the easel

3 × 4

saying

Three sets of four.

Three fours.

Ask a child

Charlene, what addition sentence can we write to show three sets of four or three fours? Write it on the easel, please.

The child records

4 + 4 + 4 = 12

Repeat several times.

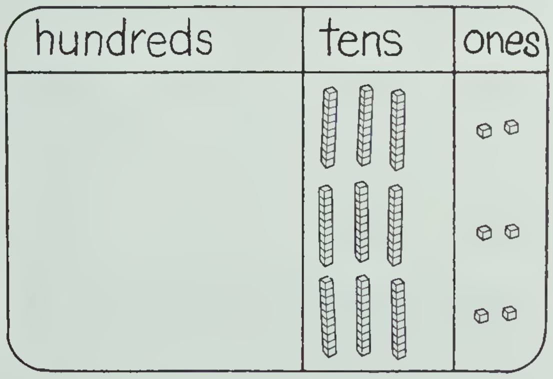
2

Write a multiplication question on the easel.

Multiply.

32
× 3

Discuss the situation to establish that the question means three sets of 32, three 32s, or 32 + 32 + 32. Then distribute the place-value materials and mats and have the children illustrate the question.



How many ones are there?

How many tens are there?

As the children respond, record the product under the question.

Multiply.

32
× 3
96

Repeat, using other examples that do not require regrouping and asking children to do the recording.

21	*44*	*13*
× 4	*× 2*	*× 3*

3

Write on the easel

Multiply.

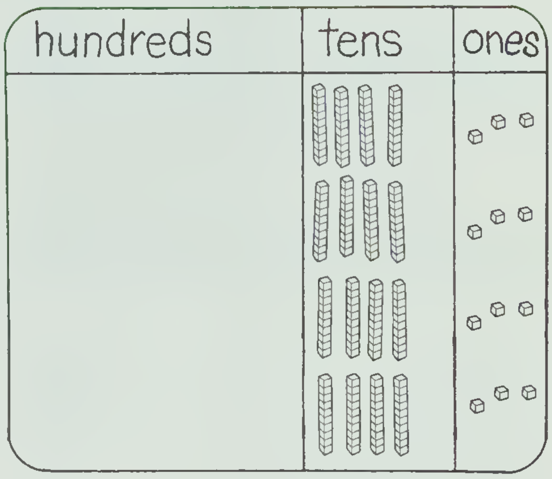
43
× 4

Ask

How many sets are there?

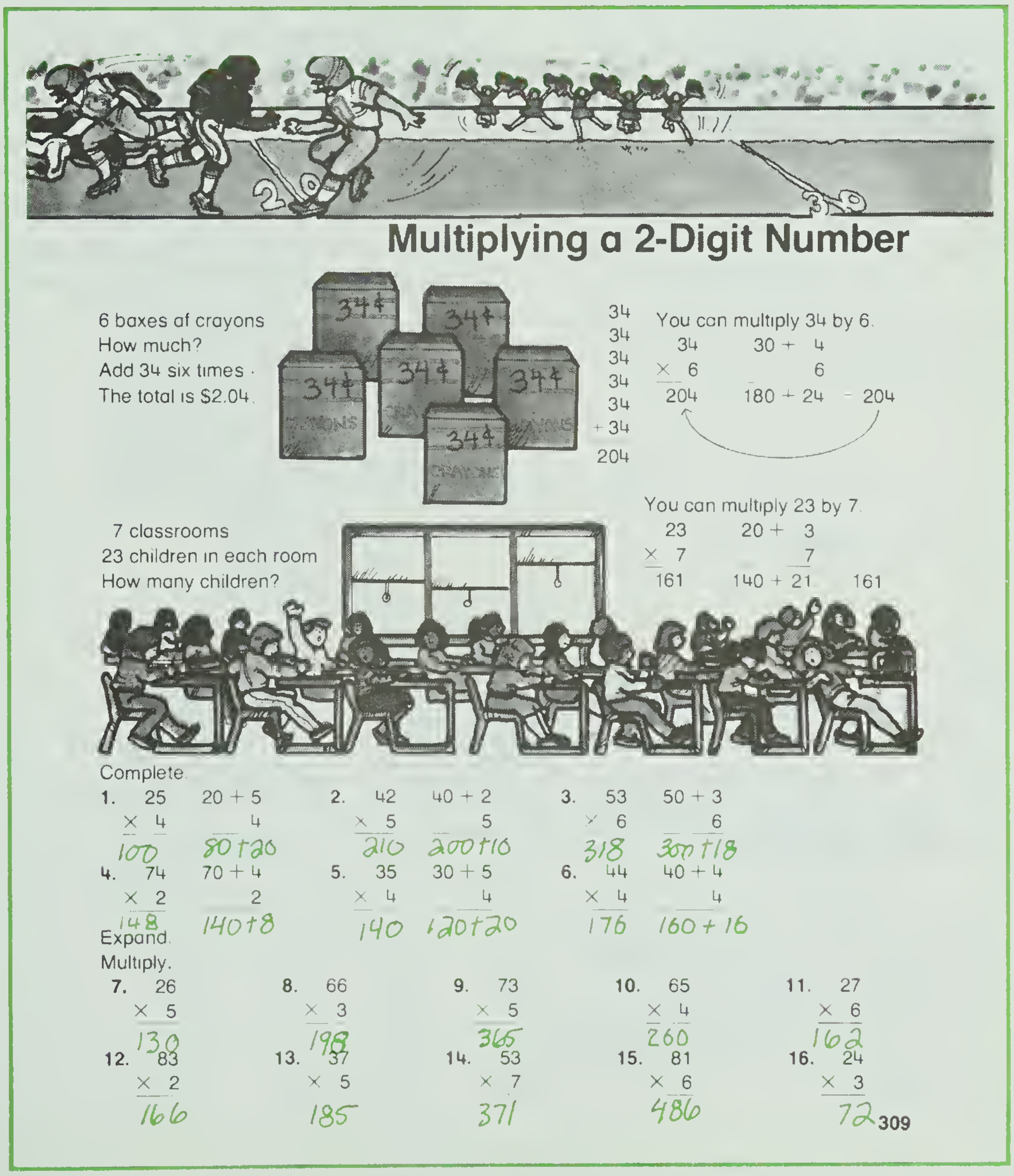
How many are in each set?

Have the children show four sets of 43 on their place-value mats.



Ray, can we have more than 9 ones in the ones column? What must we do? Can we have more than 9 tens in the tens column? What must we do, Elise?

Have the children make the exchanges.



Multiplying a 2-Digit Number

6 boxes of crayons
How much?
Add 34 six times.
The total is $2.04.

34
34
34
34
34
+ 34
204

You can multiply 34 by 6.

34
× 6
204

30 + 4
6
180 + 24 = 204

7 classrooms
23 children in each room
How many children?

You can multiply 23 by 7.

23
× 7
161

20 + 3
7
140 + 21 = 161

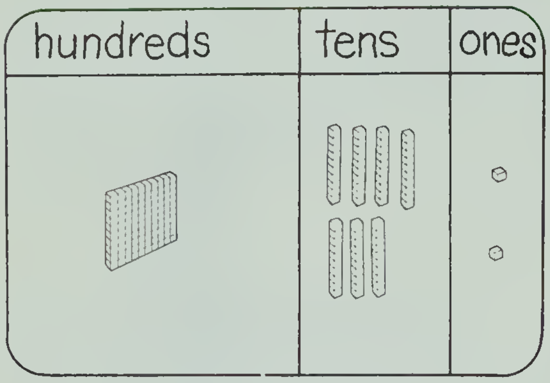
Complete.

1. 25 × 4 = 100 20 + 5 × 4 = 80+20
2. 42 × 5 = 210 40 + 2 × 5 = 200+10
3. 53 × 6 = 318 50 + 3 × 6 = 300+18
4. 74 × 2 = 148 70 + 4 × 2 = 140+8
5. 35 × 4 = 140 30 + 5 × 4 = 120+20
6. 44 × 4 = 176 40 + 4 × 4 = 160 + 16

Expand.
Multiply.

7. 26 × 5 = 130
8. 66 × 3 = 198
9. 73 × 5 = 365
10. 65 × 4 = 260
11. 27 × 6 = 162
12. 83 × 2 = 166
13. 37 × 5 = 185
14. 53 × 7 = 371
15. 81 × 6 = 486
16. 24 × 3 = 72

309



How many ones are there?
How many tens are there?
How many hundreds are there?

As the children respond record the product.

Multiply.

43
× 4
172

Repeat, using a variety of examples like these to illustrate different regroupings:

18   61   95   36
× 7   × 8   × 6   × 3

Have the children record the products.

4

Write a multiplication question that does not require regrouping.

Multiply.

42
× 2

Have a child record the expanded form of the two-digit number.

Multiply.

42   40 + 2
× 2   2

Discuss that 2 × 42 means the same thing as 2 × 2 plus 2 × 40. Record the expanded and standard forms of the product. Using other examples that do not require regrouping, repeat the procedure several times.

5

Write a multiplication question that requires regrouping. Have a child expand the two-digit numeral. Then, asking children to supply the number facts, record the product in expanded form.

Multiply.

58   50 + 8
× 7   7
350 + 56

Discuss the need to regroup. If there appears to be any confusion, have the children show the product on their place-value mats and make the necessary exchanges. Have a child record the product in standard form. Repeat several times.

Written and Other Activities

☐

mathways 3, page 309

Have children read the examples aloud. Discuss each, then have all the children illustrate with place-value materials. Give the class a few minutes to examine the In Action questions, then have individuals explain what they will do to complete them.

☐ ☐

Divide the class into small groups. Each child selects the multiplication facts of a particular number and uses them to drill the other group members.

For Your Notes

Unit 4 Section 5 Lesson 5

Multiplying a Two-Digit Number by a One-Digit Number

Lesson

1

Gather the children around the easel. Write a multiplication question. Have a child expand and multiply.

Multiply.

$$\begin{array}{r} 67 \\ \times\ 4 \\ \hline 268 \end{array} \qquad \begin{array}{r} 60 + 7 \\ 4 \\ \hline 240 + 28 \end{array}$$

Discuss the place value of each numeral during the process. If any confusion is apparent, use a place-value mat and have a child illustrate the exchanges, but do not erase the two forms of the completed question.

2

Explain to the children that multiplication questions can be recorded in a way that requires less writing. Write the same question on the easel, placing it beside the original.

Multiply.

$$\begin{array}{r} 67 \\ \times\ 4 \\ \hline 268 \end{array} \qquad \begin{array}{r} 60 + 7 \\ 4 \\ \hline 240 + 28 \end{array} \qquad \begin{array}{r} 67 \\ \times\ 4 \\ \hline \end{array}$$

Referring to the expanded form, remind the children that 4 × 67 means the same as 4 × 7 plus 4 × 60. Record these partial products in columnar form.

Multiply.

$$\begin{array}{r} 67 \\ \times\ 4 \\ \hline 28 \\ 240 \end{array}$$

Compare these products with those recorded in the expanded form of the question. Then explain that just as the partial products in the expanded form are added together to get the final product, the products recorded in columns are added. Relate the columns to columns on a place-value mat.

Grace, point out the ones column, please.

Now point out the tens column and the hundreds column.

Have the child add each column in response to these questions, emphasizing the place-value meaning of the final product:

How many ones are there?

How many tens?

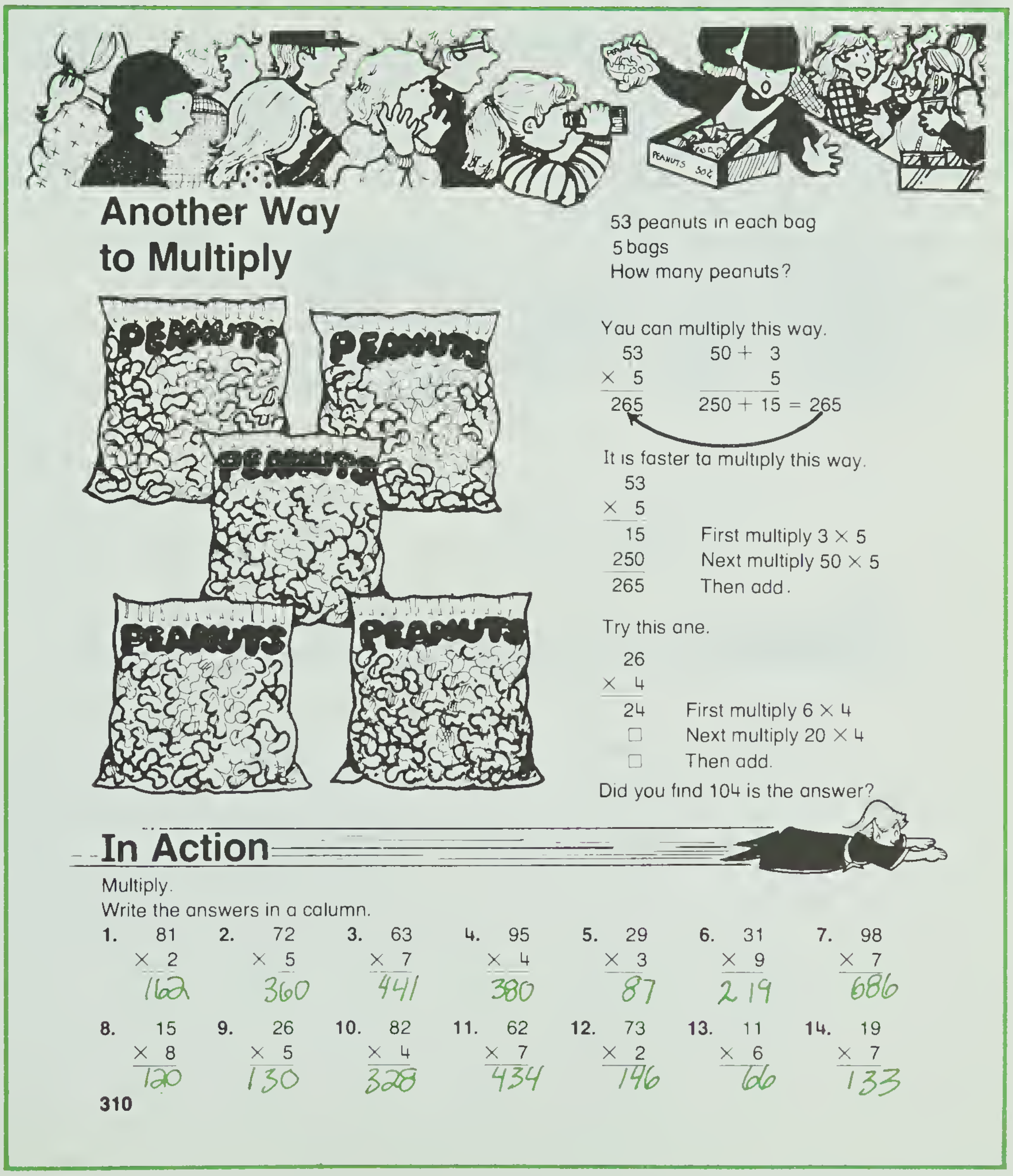
How many hundreds?

Write several other multiplication questions on the easel and have individuals complete them in two ways, following the steps described in activities 1 and 2. Continue until each child has had a turn.

3

Draw a place-value chart on the easel. Write a multiplication question in the chart and have a child complete it by recording the partial products in the columns.

hundreds	tens	ones
	7	2
X		5
	1	0
3	5	0
3	6	0



Another Way to Multiply

53 peanuts in each bag
5 bags
How many peanuts?

You can multiply this way.

$$\begin{array}{r} 53 \\ \times\ 5 \\ \hline 265 \end{array} \qquad \begin{array}{r} 50 + 3 \\ 5 \\ \hline 250 + 15 = 265 \end{array}$$

It is faster to multiply this way.

$$\begin{array}{rl} 53 & \\ \times\ 5 & \\ \hline 15 & \text{First multiply } 3 \times 5 \\ 250 & \text{Next multiply } 50 \times 5 \\ \hline 265 & \text{Then add.} \end{array}$$

Try this one.

$$\begin{array}{rl} 26 & \\ \times\ 4 & \\ \hline 24 & \text{First multiply } 6 \times 4 \\ \square & \text{Next multiply } 20 \times 4 \\ \hline \square & \text{Then add.} \end{array}$$

Did you find 104 is the answer?

In Action

Multiply.
Write the answers in a column.

1. 81 × 2 = 162
2. 72 × 5 = 360
3. 63 × 7 = 441
4. 95 × 4 = 380
5. 29 × 3 = 87
6. 31 × 9 = 219
7. 98 × 7 = 686
8. 15 × 8 = 120
9. 26 × 5 = 130
10. 82 × 4 = 328
11. 62 × 7 = 434
12. 73 × 2 = 146
13. 11 × 6 = 66
14. 19 × 7 = 133

310

Erase only the numerals from the chart and use it again for other examples. Continue the activity until each child has had a turn.

4

Erase the place-value chart. Write other questions and invite children to complete them in the new way. Remind each child to line the numerals up one under another so that their place-value meaning doesn't get confused. It may be useful to demonstrate what might happen when the numerals are recorded haphazardly.

Written and Other Activities

☐

mathways 3, page 310

Have children read and explain each step of the example.

☐ ☐

Have the children illustrate two or three of the multiplication questions on text page 310 with pictures as in the example at the top of the page, or by drawing place-value materials on place-value mats to show both partial products and the final product.

For Your Notes

For Your Notes

Unit 4 Section 5 Lesson 6

Multiplying a Two-Digit Number

Lesson

1

Gather the children around the easel. Write a multiplication question twice, leaving enough space between questions for the expanded form. Have one child complete the question using the expanded form. Have another child complete it using the columnar form.

Multiply.

$$\begin{array}{r} 47\\ \times\ 9\\ \hline 423 \end{array} \qquad \begin{array}{r} 40 + 7\\ 9\\ \hline 360 + 63 \end{array} \qquad \begin{array}{r} 47\\ \times\ 9\\ \hline 63\\ 360\\ \hline 423 \end{array}$$

Patricia, can you tell us how these two ways of multiplying are the same? Invite all the children to comment. They may mention that the products are the same or that the same partial products appear in both forms and are added together to get the final product. During the discussion emphasize that the numerals in each question are equivalent in value, or mean the same thing.

Ken, can you tell us how these two ways of multiplying are different? Invite all the children to state the difference. Some may mention that the numerals are expanded in one case but not in the other, or that the partial products are recorded in columns for one method but not the other.

Write other multiplication questions on the easel. Each time, have two children complete the question, using both forms. Continue until all the children have had a turn.

2

Write a multiplication question on the easel. Invite two children to complete it, using both forms.

$$\begin{array}{r} 25\\ \times\ 5\\ \hline 125 \end{array} \qquad \begin{array}{r} 20 + 5\\ 5\\ \hline 100 + 25 \end{array} \qquad \begin{array}{r} 25\\ \times\ 5\\ \hline 25\\ 100\\ \hline 125 \end{array}$$

Discuss the question, explaining that it might describe any number of real situations involving real things. It might be about five sets of 25 baseballs; it might be about money, for example, five quarters. It might be about five bookshelves containing 25 books each. Invite each child in the group to suggest what the question might be about. Then use the question to make up a word problem. Write the problem on the easel.

5 bags of chocolate cookies
25 cookies in each bag
How many cookies altogether?

Have each child write a problem that involves multiplying a two-digit number by a one-digit number. When the task is finished, have the children exchange papers and solve the problems, using both methods for multiplying.

Written and Other Activities

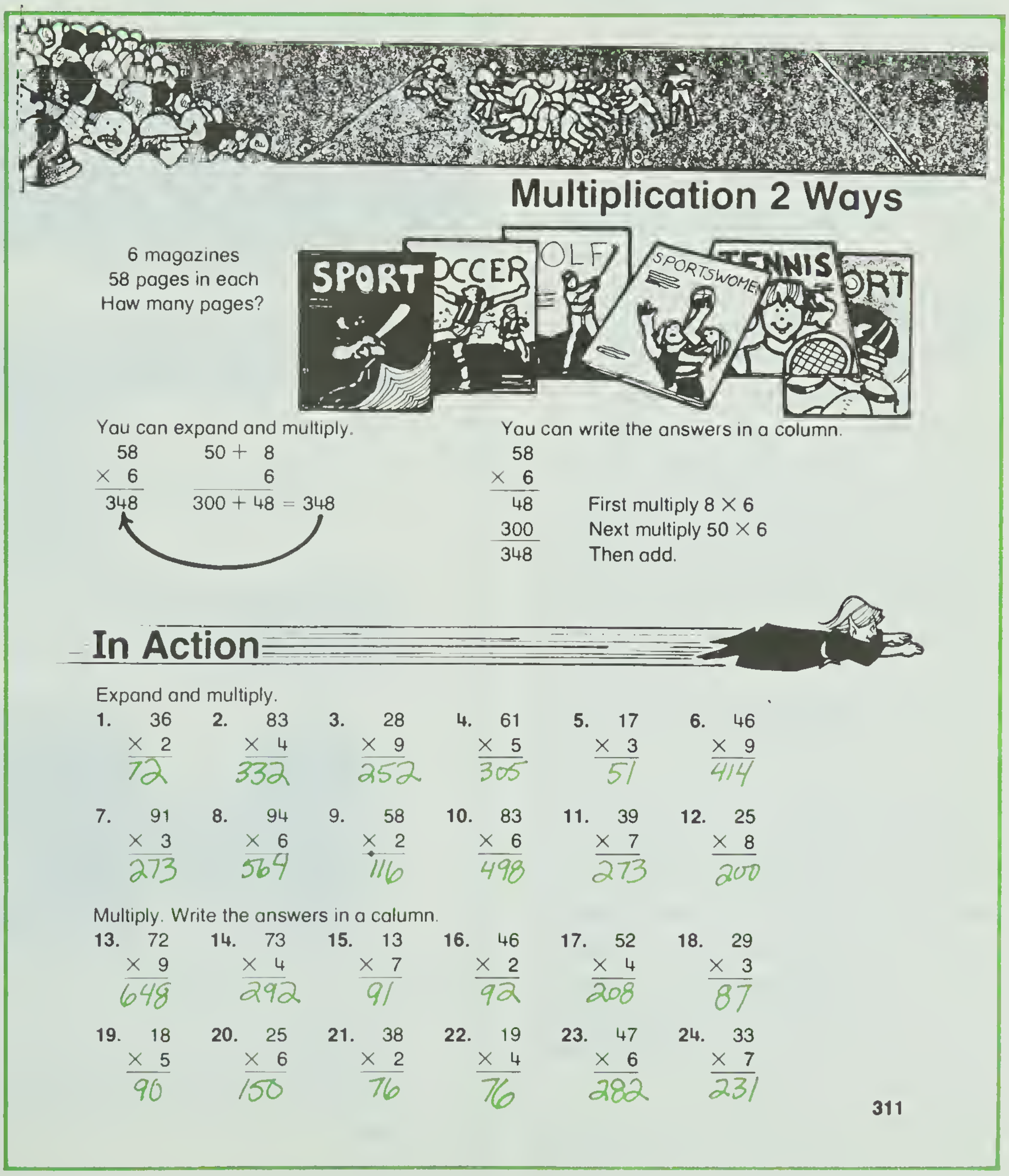
☐

mathways 3, page 311

Read and discuss the example, relating the problem and the two forms of the multiplication question to the problems completed during the lesson.

☐ ☐

Review multiplication and division facts to emphasize the relation between the two operations and to prepare the children for the next group of lessons on division.



Multiplication 2 Ways

6 magazines
58 pages in each
How many pages?

You can expand and multiply.

$$\begin{array}{r} 58\\ \times\ 6\\ \hline 348 \end{array} \qquad \begin{array}{r} 50 + 8\\ 6\\ \hline 300 + 48 = 348 \end{array}$$

You can write the answers in a column.

$$\begin{array}{r} 58\\ \times\ 6\\ \hline 48\\ 300\\ \hline 348 \end{array}$$

First multiply 8 × 6
Next multiply 50 × 6
Then add.

In Action

Expand and multiply.

1. $\begin{array}{r} 36\\ \times\ 2\\ \hline 72 \end{array}$ 2. $\begin{array}{r} 83\\ \times\ 4\\ \hline 332 \end{array}$ 3. $\begin{array}{r} 28\\ \times\ 9\\ \hline 252 \end{array}$ 4. $\begin{array}{r} 61\\ \times\ 5\\ \hline 305 \end{array}$ 5. $\begin{array}{r} 17\\ \times\ 3\\ \hline 51 \end{array}$ 6. $\begin{array}{r} 46\\ \times\ 9\\ \hline 414 \end{array}$

7. $\begin{array}{r} 91\\ \times\ 3\\ \hline 273 \end{array}$ 8. $\begin{array}{r} 94\\ \times\ 6\\ \hline 564 \end{array}$ 9. $\begin{array}{r} 58\\ \times\ 2\\ \hline 116 \end{array}$ 10. $\begin{array}{r} 83\\ \times\ 6\\ \hline 498 \end{array}$ 11. $\begin{array}{r} 39\\ \times\ 7\\ \hline 273 \end{array}$ 12. $\begin{array}{r} 25\\ \times\ 8\\ \hline 200 \end{array}$

Multiply. Write the answers in a column.

13. $\begin{array}{r} 72\\ \times\ 9\\ \hline 648 \end{array}$ 14. $\begin{array}{r} 73\\ \times\ 4\\ \hline 292 \end{array}$ 15. $\begin{array}{r} 13\\ \times\ 7\\ \hline 91 \end{array}$ 16. $\begin{array}{r} 46\\ \times\ 2\\ \hline 92 \end{array}$ 17. $\begin{array}{r} 52\\ \times\ 4\\ \hline 208 \end{array}$ 18. $\begin{array}{r} 29\\ \times\ 3\\ \hline 87 \end{array}$

19. $\begin{array}{r} 18\\ \times\ 5\\ \hline 90 \end{array}$ 20. $\begin{array}{r} 25\\ \times\ 6\\ \hline 150 \end{array}$ 21. $\begin{array}{r} 38\\ \times\ 2\\ \hline 76 \end{array}$ 22. $\begin{array}{r} 19\\ \times\ 4\\ \hline 76 \end{array}$ 23. $\begin{array}{r} 47\\ \times\ 6\\ \hline 282 \end{array}$ 24. $\begin{array}{r} 33\\ \times\ 7\\ \hline 231 \end{array}$

311

Unit 4 Section 5 Lesson 7

Multiplying by 100: Converting Metres to Centimetres

Materials

- for each child
  - metre stick marked in centimetres

Lesson

1

Gather the children around the working area and give each child a metre stick.

Look at your metre sticks, please. How many centimetres are there?

Record on the easel

1 m = *100* cm

Have a child read the expression aloud, pointing to the symbols for centimetres and metres.

Paul and Marlene, please lay your metre sticks on the floor, end to end. How many centimetres are in two metres?

Have a child record

2 m = *200* cm

and read the expression aloud. Then, underneath the expression write

2 × *100* = *200*

Marnie, can you explain why I have written this multiplication sentence? What does the sentence tell us?

Through discussion, reach a consensus that there are two sets of 100 and that the two sets have been combined to form one set of 200.

Have the children lay three metres sticks on the floor, end to end, then four metre sticks, and so on. Each time have a child record the expression and companion multiplication sentence on the easel.

2

Assign each pair of children the task of measuring something in the classroom to the nearest metre. One pair might measure the distance between one window and the next, another pair the distance from the door to the blackboard, and so on. Have them record the number of metres on paper. Then call the children back to the working area to report on their findings. For the first report, record on the easel, for example,

The length from Joe's desk to Mary's desk equals 3 m.

1 m = *100* cm

3 × *100* = *300*

3 m = *300* cm

Have the other pairs report and record their findings on the easel in the same manner.

Written and Other Activities

☐

mathways 3, page 312

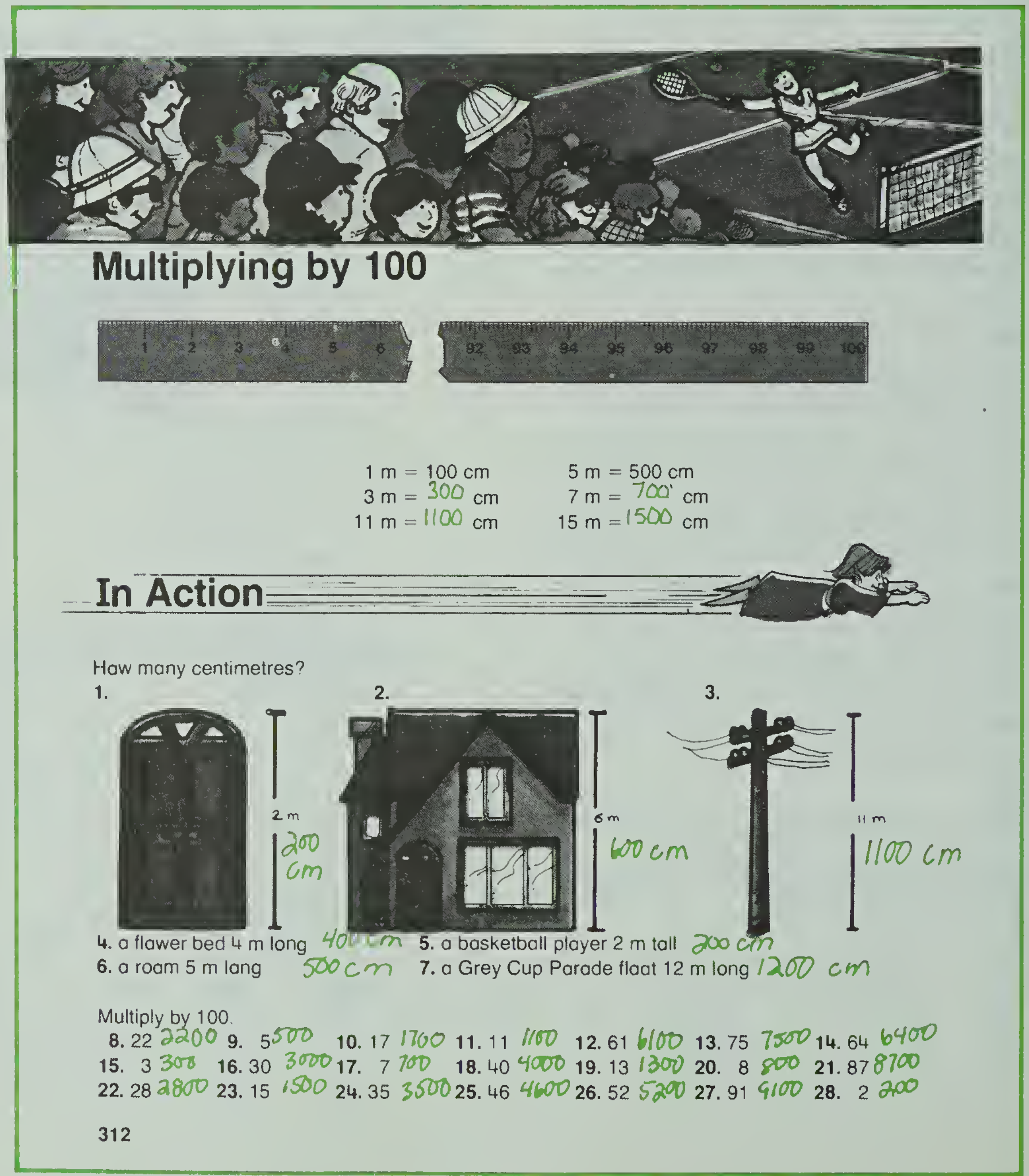
Discuss the example and questions 1 to 7. Assign questions 8 to 28.

☐ ☐

Have each child estimate and measure the length of 10 objects, and fill in a chart for display in the classroom.

Estimate in metres	Measurement in metres	Length in centimetres

Instruct the children to convert metres to centimetres by multiplying by 100.



Multiplying by 100

1 m = 100 cm
3 m = 300 cm
11 m = 1100 cm
5 m = 500 cm
7 m = 700 cm
15 m = 1500 cm

In Action

How many centimetres?

1. 2 m 200 cm
2. 6 m 600 cm
3. 11 m 1100 cm

4. a flower bed 4 m long 400 cm
5. a basketball player 2 m tall 200 cm
6. a room 5 m long 500 cm
7. a Grey Cup Parade float 12 m long 1200 cm

Multiply by 100.

8. 22 2200
9. 5 500
10. 17 1700
11. 11 1100
12. 61 6100
13. 75 7500
14. 64 6400
15. 3 300
16. 30 3000
17. 7 700
18. 40 4000
19. 13 1300
20. 8 800
21. 87 8700
22. 28 2800
23. 15 1500
24. 35 3500
25. 46 4600
26. 52 5200
27. 91 9100
28. 2 200

312

Unit 4 Section 5 Lesson 8

Multiplying by 100: Converting Dollars to Cents

Materials

- one dollar bill
- 100 pennies
- abacus
- 100-flats

Lesson

1

Gather the children around the working area. Place a one-dollar bill and 10 stacks of 10 pennies side by side.

What do you know about the value of these two amounts of money?

Count the dollars please, Francis.

Trudy, count the pennies, please.

Make as many piles of 10 pennies as you can.

When the children have finished the task, record on the easel

1 dollar = 100 cents

1 × 100 = 100

2

Ask a child

How many cents are there in two dollars, Ken?

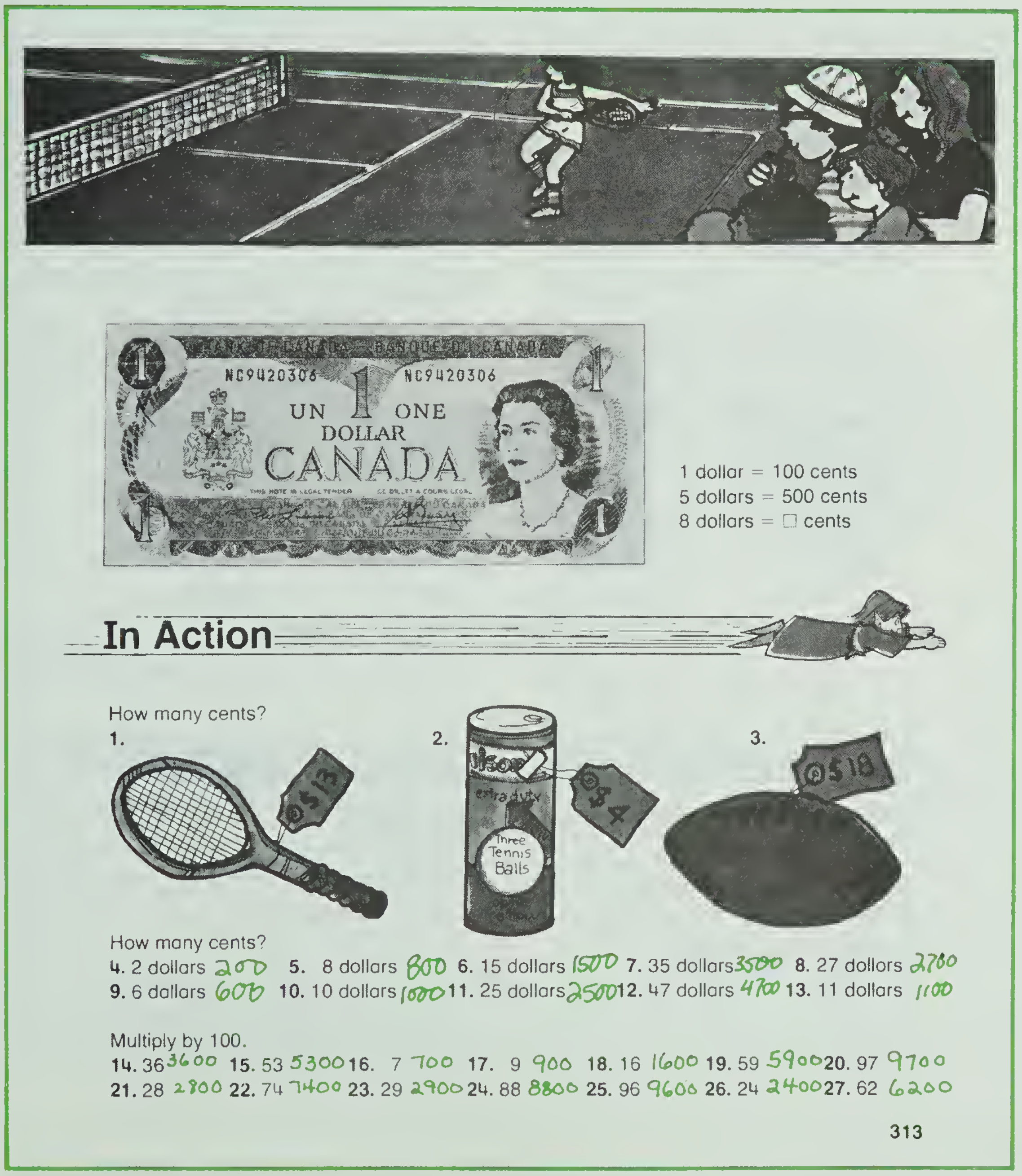
How many piles of 10 pennies would make two dollars?

Record on the easel

2 dollars equal 200 cents

2 × 100 = 200

Repeat several times, substituting other amounts of money — five dollars, ten dollars, thirty-two dollars and so on. Have the children do the recording on the easel.



1 dollar = 100 cents
5 dollars = 500 cents
8 dollars = ☐ cents

In Action

How many cents?

1.

2.

3.

How many cents?

4. 2 dollars 200 5. 8 dollars 800 6. 15 dollars 1500 7. 35 dollars 3500 8. 27 dollars 2700
9. 6 dollars 600 10. 10 dollars 1000 11. 25 dollars 2500 12. 47 dollars 4700 13. 11 dollars 1100

Multiply by 100.

14. 36 3600 15. 53 5300 16. 7 700 17. 9 900 18. 16 1600 19. 59 5900 20. 97 9700
21. 28 2800 22. 74 7400 23. 29 2900 24. 88 8800 25. 96 9600 26. 24 2400 27. 62 6200

313

3

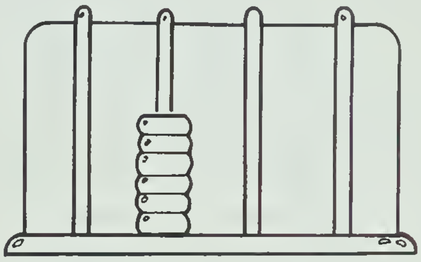
Have the children write the products for multiplication questions delivered orally and in random order; for example, 100 × 8, 15 × 100, 100 × 55, . . .

4

Have the children count by hundreds forward and backward.

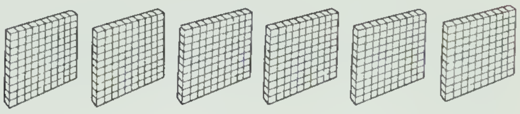
5

Show from 1 to 9 discs on the hundreds wire of an abacus. Each time, have a child come to the easel and record the multiplication sentence.



6 × 100 = 600

Have another child show the same sentence with 100-flats.



6 × 100 = 600

6

Discuss with children things they would like to buy in the near future. Some children may be saving for sports equipment; others may be saving for a trip to an amusement park or for a toy.

How many dollars will your skates cost, Harriet? How many cents is that?

or

How many pennies have you got in your piggy bank now, Brian? How many dollars is that? How many more dollars do you need? How many more pennies?

Written and Other Activities

☐

mathways 3, page 313

Unit 4 Section 6 Lesson 1

Exploring Division: Recalling Facts to 81 ÷ 9, Using the Symbol $\overline{)\quad}$

Materials

- counters
- blank cards

Lesson

1

Gather the children around the easel. Write a division question, for example *15 ÷ 5.*

Place counters in the centre of the area, and have the children show the questions with the counters in response to these questions:

How many counters are we dividing into sets?

The children count out 15 counters.

How many sets shall we make?

The children arrange the counters into five equal sets.

How many counters are in each set?

Have a child record the quotient.

15 ÷ 5 = 3

Invite one child to draw a picture on the easel to illustrate the division sentence while the others draw on paper. When the pictures are finished, record beneath them

15 counters in sets of 5 makes 3 sets.

Repeat, substituting other division questions.

2

Write a division sentence on the easel.

24 ÷ 3 = 8

Discuss its meaning in terms of sets of counters. Then tell the children that there is another way to write the sentence. Record on the easel

$$\begin{array}{r}8\\3\overline{)24}\end{array}$$

Invite several children to draw the symbol on the easel. Compare the two ways of recording division facts, noting the positioning of the numbers in the new way; for example, the quotient 8 is written directly above the 4 in the dividend 24, not above the 2.

Write several other division sentences on the easel. Each time, have one child rewrite the sentence on the easel using the new form while the others record it on paper. Reverse the procedure: write division facts in the new form and have children rewrite them in the old form.

3

Write a division question on the easel

$9\overline{)27}$

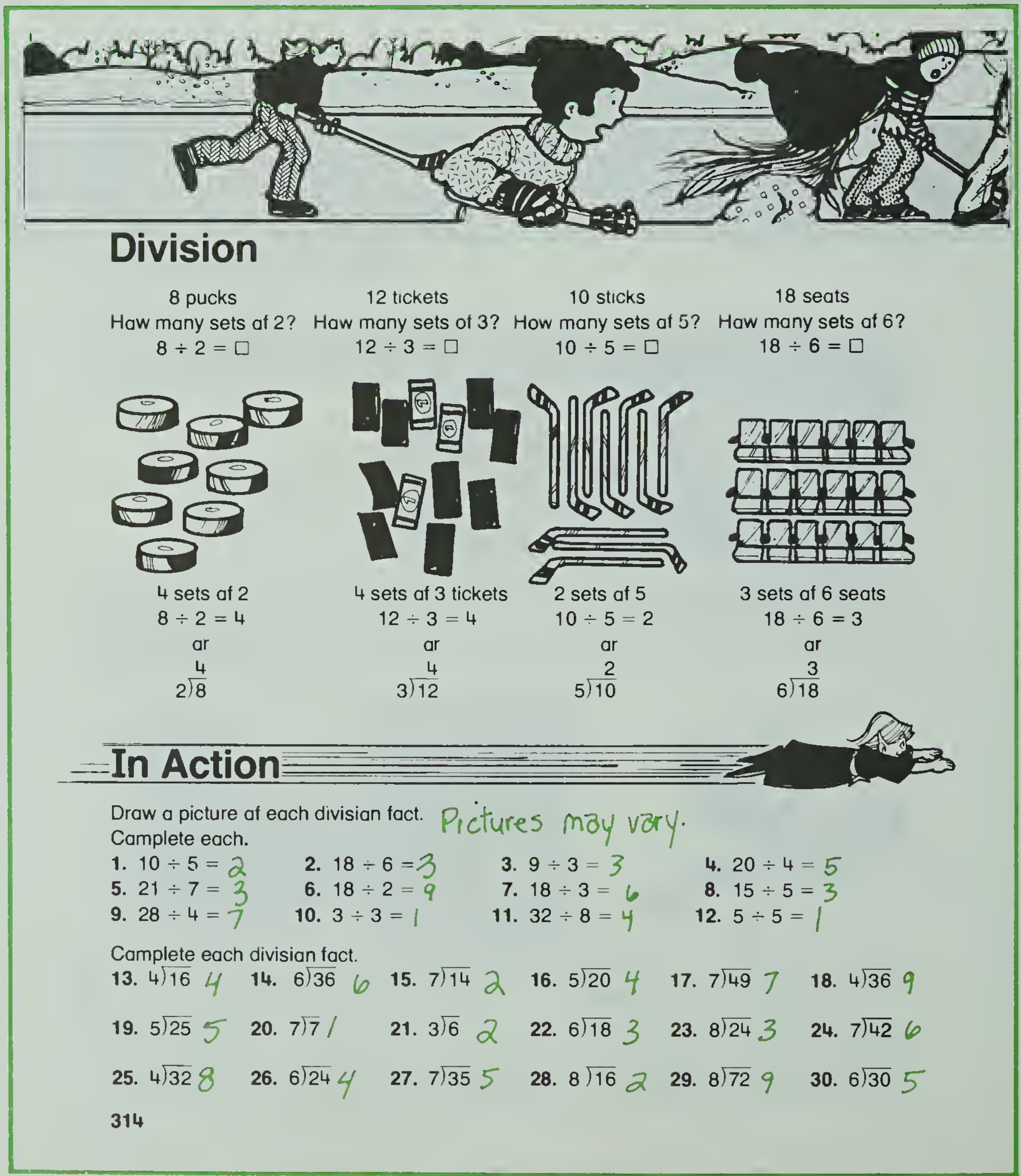
Which number represents the set that will be divided?

Which number shows the number of sets?

Use counters to find the answer to this question, please. Then record the number of counters that are in each of the sets you make.

The children count out 27 counters, divide them into nine groups of three counters and record 3 as the quotient. Leave the completed question on the easel. Repeat the procedure several times. Then have each child draw a picture illustrating one of the completed questions still on the easel.

The children may need some suggestions about what they might draw: for example, they might draw cookies or doughnuts, sticks of gum, brazil nuts, baseballs, marbles, stars, etc. Or they might simply draw dots or Xs. When the pictures have been completed, discuss each to show the inverse relation between multiplication and division. Have each child explain the difference between multiplication and division. When it has been established that division involves separating one large set into smaller sets and multiplication involves combining sets, have the children write a multiplication sentence for each of the pictures on display.



Division

8 pucks	12 tickets	10 sticks	18 seats
How many sets of 2?	How many sets of 3?	How many sets of 5?	How many sets of 6?
8 ÷ 2 = ☐	12 ÷ 3 = ☐	10 ÷ 5 = ☐	18 ÷ 6 = ☐
4 sets of 2	4 sets of 3 tickets	2 sets of 5	3 sets of 6 seats
8 ÷ 2 = 4	12 ÷ 3 = 4	10 ÷ 5 = 2	18 ÷ 6 = 3
or	or	or	or
$\begin{array}{r}4\\2\overline{)8}\end{array}$	$\begin{array}{r}4\\3\overline{)12}\end{array}$	$\begin{array}{r}2\\5\overline{)10}\end{array}$	$\begin{array}{r}3\\6\overline{)18}\end{array}$

In Action

Draw a picture of each division fact. Pictures may vary.

Complete each.

1. 10 ÷ 5 = 2 **2.** 18 ÷ 6 = 3 **3.** 9 ÷ 3 = 3 **4.** 20 ÷ 4 = 5

5. 21 ÷ 7 = 3 **6.** 18 ÷ 2 = 9 **7.** 18 ÷ 3 = 6 **8.** 15 ÷ 5 = 3

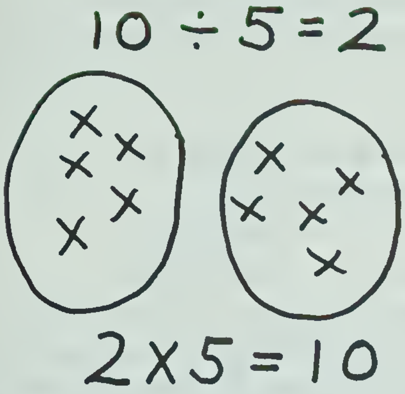
9. 28 ÷ 4 = 7 **10.** 3 ÷ 3 = 1 **11.** 32 ÷ 8 = 4 **12.** 5 ÷ 5 = 1

Complete each division fact.

13. $4\overline{)16}$ 4 **14.** $6\overline{)36}$ 6 **15.** $7\overline{)14}$ 2 **16.** $5\overline{)20}$ 4 **17.** $7\overline{)49}$ 7 **18.** $4\overline{)36}$ 9

19. $5\overline{)25}$ 5 **20.** $7\overline{)7}$ 1 **21.** $3\overline{)6}$ 2 **22.** $6\overline{)18}$ 3 **23.** $8\overline{)24}$ 3 **24.** $7\overline{)42}$ 6

25. $4\overline{)32}$ 8 **26.** $6\overline{)24}$ 4 **27.** $7\overline{)35}$ 5 **28.** $8\overline{)16}$ 2 **29.** $8\overline{)72}$ 9 **30.** $6\overline{)30}$ 5



4

Divide the children into small groups. Give each group a specific number of counters; for example, give one group 10 counters, give a second group 8 counters, a third group 12 counters, a fourth 15 counters and so on. Have the groups separate their counters into sets in as many ways as possible, each time recording a division fact. As the children work, visit each group and make suggestions. When they have discovered all the division facts that can be made with their counters, have them appoint a member to record the facts on the easel. Have the entire class record all of these facts in their notebooks and, beside each fact, write a multiplication sentence.

$12 \div 3 = 4$ $4 \times 3 = 12$
$12 \div 4 = 3$ $3 \times 4 = 12$
$12 \div 2 = 6$ $6 \times 2 = 12$
$12 \div 6 = 2$ $2 \times 6 = 12$
$12 \div 12 = 1$ $1 \times 12 = 12$

Written and Other Activities

☐

mathways 3, page 314

Discuss the examples, asking children to tell why division is used to solve the problems. For the In Action questions, remind the children that the pictures they draw can be very simple.

☐ ☐

Have the children write a multiplication fact for each picture drawn for text page 314.

☐ ☐ ☐

Have each child make a few activity cards for the activity centre. On each card, the child draws a picture to illustrate a secret division fact. In spare time, other children look at the cards and write the division facts illustrated by each picture.

☐ ☐ ☐ ☐

Small groups of children can use 20 cards prepared for the previous activity to play a game. The leader displays one card at a time. The first player to state the division fact takes the card. When all the cards have been taken, the players count their cards. The child with the greatest number of cards wins the game.

☐ ☐ ☐ ☐ ☐

Have the children write out word problems involving division, using the problems on *mathways 3* page 314 as a model. Have the children exchange papers and solve the problems.

☐ ☐ ☐ ☐ ☐ ☐

Have children contribute division problems written on cards to the activity centre.

☐ ☐ ☐ ☐ ☐ ☐ ☐

Have children write the products for multiplication questions delivered orally. Pace the activity as quickly as possible. Afterward, have the children write the corresponding division fact beside each. Then reverse the procedure.

For Your Notes

Unit 4 Section 6 Lesson 2

Recalling Division Facts

Materials
- counters
- *Concentration* cards, *see* ☐ ☐ ☐
- gameboard and tiles, *see* ☐ ☐ ☐ ☐ ☐
- for each child
  - sheet of graph paper or dot paper reproduced from Program Masters 5 and 2
  - blank card

Lesson
1

Invite the children into the working area. Place a plentiful supply of counters in the centre.

Jerry, think of a division fact. Don't tell anyone what it is, but show the fact with counters.

Counting aloud, the child puts aside a group of counters, then silently separates it into sets. The other children guess the fact. Have a volunteer write the fact in two ways on the easel. For example, the demonstrator makes six sets of three counters. The recorder writes on the easel

$18 \div 3 = 6 \quad \begin{array}{r}6\\ 3\overline{)18}\end{array}$

Have all the children count out 18 counters and show other division facts. Each time a new fact is presented, have it recorded in both forms on the easel.

Continue in this manner until no more division facts can be illustrated. Leave the facts on the easel.

Referring to the first fact on the easel, say

Martha, please come to the easel and write a multiplication fact for this division fact.

The child writes

$3 \times 6 = 18$

What other multiplication fact can you write?

The child records $6 \times 3 = 18$.

Remind the children that the related multiplication facts can also be written in vertical form.

It may be useful to have the entire group record these facts in their notebooks as the activity proceeds.

Erase the first group of facts and have another child demonstrate a secret fact. Continue in this manner until all the children have shown a secret fact.

2

Repeat activity 1, but this time have the children draw a picture of the secret division fact on the easel. To keep the pace moving, a specific instruction might be given to each child.

For example

Suzanne, draw counters to show your secret fact.

Gregory, draw Xs to show yours, and Helen, draw pennies.

Instruct the children to think of facts other than those reviewed during the first activity, so that the exercise will provide as thorough a recall as is possible in the allotted time.

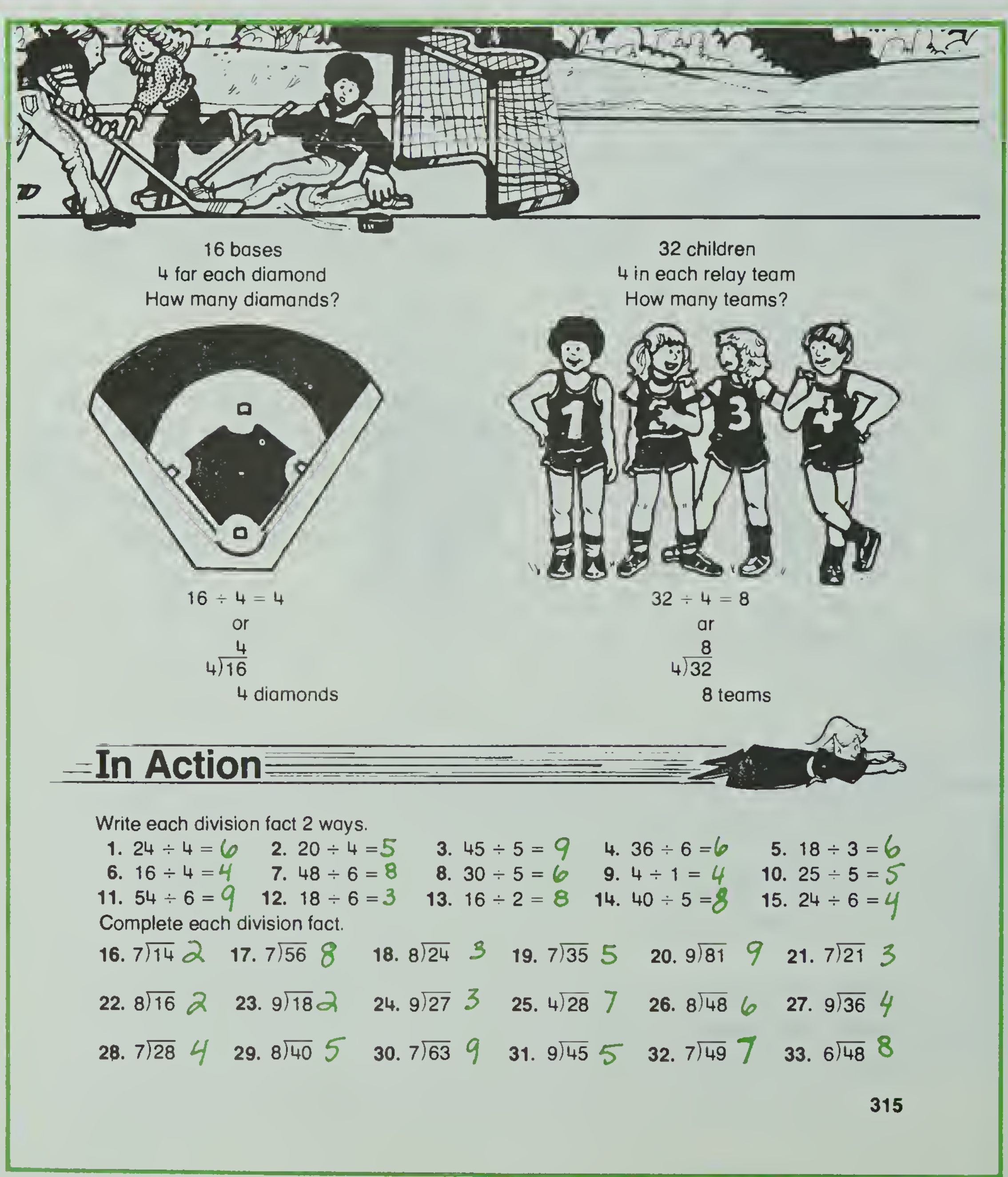
Written and Other Activities
☐

mathways 3, page 315

Discuss the examples. Have children read and explain the instructions for completing the In Action questions.

☐ ☐

Give half the class dot paper and the other half graph paper. The children use the paper to illustrate and record division facts. The children with graph paper colour the number of squares representing the set to be divided, then loop the set. The children with dot



16 bases
4 for each diamond
How many diamonds?

$16 \div 4 = 4$
or
$\begin{array}{r}4\\ 4\overline{)16}\end{array}$
4 diamonds

32 children
4 in each relay team
How many teams?

$32 \div 4 = 8$
or
$\begin{array}{r}8\\ 4\overline{)32}\end{array}$
8 teams

In Action

Write each division fact 2 ways.

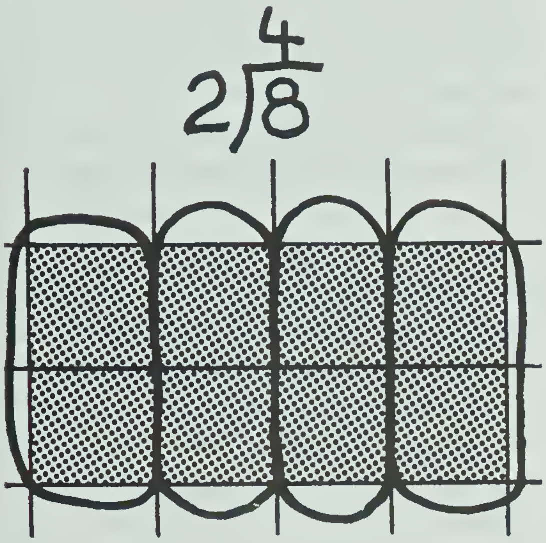
1. $24 \div 4 =$ 6 2. $20 \div 4 =$ 5 3. $45 \div 5 =$ 9 4. $36 \div 6 =$ 6 5. $18 \div 3 =$ 6
6. $16 \div 4 =$ 4 7. $48 \div 6 =$ 8 8. $30 \div 5 =$ 6 9. $4 \div 1 =$ 4 10. $25 \div 5 =$ 5
11. $54 \div 6 =$ 9 12. $18 \div 6 =$ 3 13. $16 \div 2 =$ 8 14. $40 \div 5 =$ 8 15. $24 \div 6 =$ 4

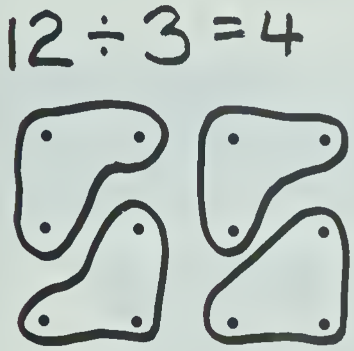
Complete each division fact.

16. $7\overline{)14}$ 2 17. $7\overline{)56}$ 8 18. $8\overline{)24}$ 3 19. $7\overline{)35}$ 5 20. $9\overline{)81}$ 9 21. $7\overline{)21}$ 3
22. $8\overline{)16}$ 2 23. $9\overline{)18}$ 2 24. $9\overline{)27}$ 3 25. $4\overline{)28}$ 7 26. $8\overline{)48}$ 6 27. $9\overline{)36}$ 4
28. $7\overline{)28}$ 4 29. $8\overline{)40}$ 5 30. $7\overline{)63}$ 9 31. $9\overline{)45}$ 5 32. $7\overline{)49}$ 7 33. $6\overline{)48}$ 8

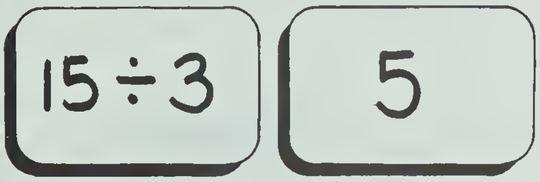
315

paper cut out dots and loop sets. Display these illustrations in the classroom.





☐ ☐ ☐
Prepare cards such as these and have the children use them to play *Concentration.*

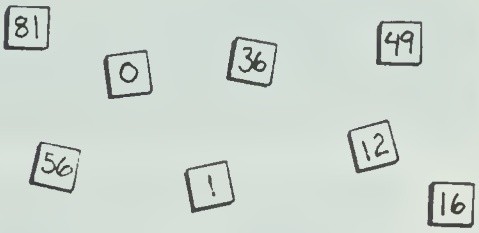


☐ ☐ ☐ ☐
Have each child contribute a word problem written on a card to the activity centre. They may use the problems on *mathways 3* page 315 as a model.

☐ ☐ ☐ ☐ ☐
To reinforce multiplication facts, prepare a gameboard as illustrated.

X	0	1	2	3	4	5	6	7	8	9
0										
1					4					
2						10				
3							18			
4						20		28		
5					20				40	
6						30				
7										
8										
9										

Make 100 paper tiles each the size of the individual squares on the gameboard, one for each product on the multiplication chart.



The 100 product tiles are turned face down in the centre of the playing area. Each player draws five tiles. The first player places a tile face up on any one of the squares in its correct location on the gameboard. The next player must place a tile so that it touches a corner of the tile on the board. The third player must place a tile so that it touches a corner of a tile already played and so on. If a player cannot at any time make a play, he or she draws from the pile until a play is possible. The winner is the first player to use all of her or his tiles.

X	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

☐ ☐ ☐ ☐ ☐ ☐
Have a child place as many tiles on the gameboard in their correct position as possible in a 4 min time span.

Unit 4 Section 6 Lesson 3

PROBLEM SOLVING

Illustrating Word Problems Involving Division

Materials

- stencil, *see* ☐ ☐ ☐ ☐

Rationale

Drawing pictures to represent the information given in word problems frequently helps the children to interpret and solve the problems. Displaying several pictures of the same problem effectively demonstrates that the same information can be accurately rendered in several different ways, and shows that numerical and verbal representations contained in a problem truly describe a real and familiar world.

Lesson

1

Gather the children around the working area for a discussion of team activities. Give each child an opportunity to tell what teams they have been members of, how many other children were on the teams, and so forth. Using the information the children have provided, write a division problem on the easel. For example

6 badminton players
2 on each team
How many teams?

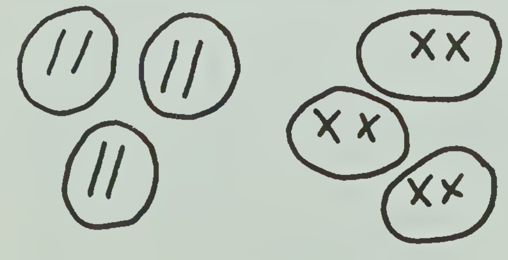
Have six children form teams of two to illustrate. Appoint a child to write the division fact on the easel.

$$\begin{array}{r}3\\2\overline{)6}\end{array}$$

Referring to the numbers, say

Six players divided into teams of two players makes three badminton teams.

Then invite a child to come to the easel and draw three teams of badminton players. Have a second child draw a different picture to show the teams.



Compare the two pictures, emphasizing that in spite of their differences, both pictures give the same information. Draw a third picture showing another pictorial alternative. Make the drawing simpler or more complex than the children's drawings. Then ask children to note the differences and similarities between the three pictures. Do the children agree that all three pictures describe the teams formed at the beginning of the activity? Do they agree that all three pictures represent the problem written on the easel?

Repeat the activity, substituting word problems based on other familiar experiences.

2

Have eight children stand up.

How many teams of two can we make? Form teams of two, please, so that we can find out.

Have a child record the division fact on the easel.

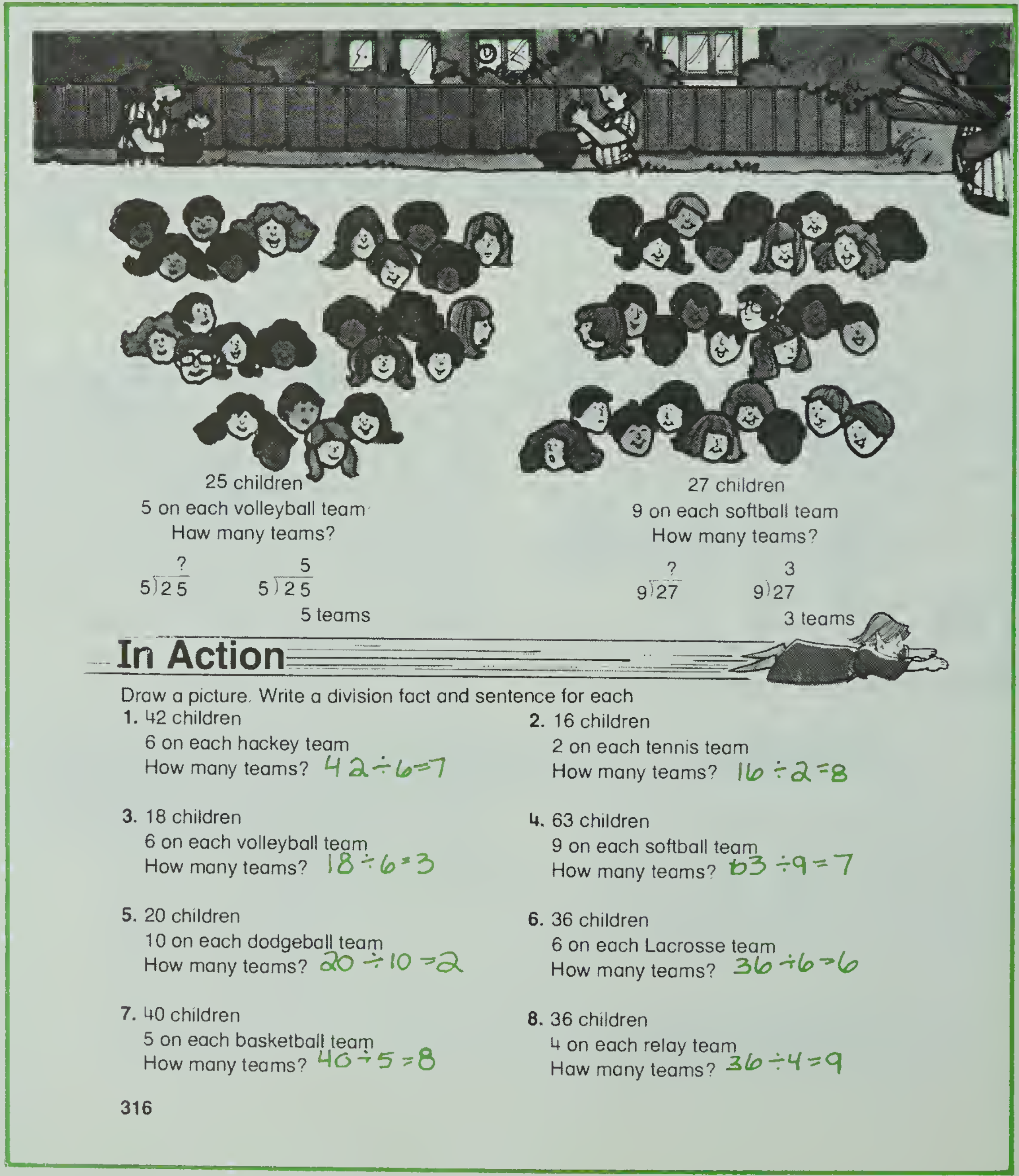
How many teams of four can we make?

Have another child record the fact.

How many teams of eight can we make?

How many teams of one?

Appoint different children to illustrate each fact by drawing pictures on paper. Compare the pictures, discussing differences and emphasizing the fact that each accurately renders the problem delivered verbally.



25 children
5 on each volleyball team
How many teams?

$\begin{array}{r}?\\5\overline{)25}\end{array}$ $\begin{array}{r}5\\5\overline{)25}\end{array}$

5 teams

27 children
9 on each softball team
How many teams?

$\begin{array}{r}?\\9\overline{)27}\end{array}$ $\begin{array}{r}3\\9\overline{)27}\end{array}$

3 teams

In Action

Draw a picture. Write a division fact and sentence for each

1. 42 children
   6 on each hackey team
   How many teams? 42÷6=7
2. 16 children
   2 on each tennis team
   How many teams? 16÷2=8
3. 18 children
   6 on each volleyball team
   How many teams? 18÷6=3
4. 63 children
   9 on each softball team
   How many teams? 63÷9=7
5. 20 children
   10 on each dodgeball team
   How many teams? 20÷10=2
6. 36 children
   6 on each Lacrosse team
   How many teams? 36÷6=6
7. 40 children
   5 on each basketball team
   How many teams? 40÷5=8
8. 36 children
   4 on each relay team
   How many teams? 36÷4=9

316

3

Imagine that nine of us are going tobogganing.

Have nine children stand and form equal teams. Draw a picture of these groups on the easel. Then, invite a child to state a word problem to go with the picture. Write the problem on the easel.

9 children
3 on each toboggan team
3 teams

Have a child write the division fact that answers the problem. Have another child write an answer.

$$\begin{array}{r} 3 \\ 3\overline{)9} \end{array}$$

Repeat, giving several other children an opportunity to create a word problem to accompany a picture.

Written and Other Activities

☐

mathways 3, page 316

Invite children to read and discuss the examples. Discuss why division is used to solve the problem in each case.

☐ ☐

Have the children create and illustrate word problems, using the model provided on text page 316. Encourage the children to choose other subjects if they wish, for example, birds on a tree branch or frogs in a pond. Have the children exchange papers and solve the problems by interpreting the information given in the pictures. Have them write the relevant division fact for each problem under the picture.

☐ ☐ ☐

As an art lesson, have each child select a problem from *mathways* 3 page 316 and draw and colour a detailed picture. Instruct the children to write the problem and the division fact that solves the problem underneath the picture. Display these in the classroom.

☐ ☐ ☐ ☐

Create a stencil similar to the following and duplicate a copy for each child.

Draw a picture to illustrate each problem.
Write the division fact that answers the problem.

1. *9 children*
   3 on each team
   How many teams?
2. *12 children*
   6 on each team
   How many teams?
3. *15 children*
   3 on each team
   How many teams?
4. *20 children*
   4 on each team
   How many teams?
5. *8 children*
   8 on each team
   How many teams?
6. *7 children*
   1 on each team
   How many teams?
7. *18 children*
   9 on each team
   How many teams?
8. *20 children*
   10 on each team
   How many teams?
9. *6 children*
   6 on each team
   How many teams?
10. *14 children*
    2 on each team
    How many teams?

For Your Notes

Unit 4 Section 6 Lesson 4

Telling Time: Using a Calendar

Materials

- display-size calendar page for the current month
- large calendar of the current year made from calendar pages glued on chart paper
- for each child
  - calendar pages duplicated from Program Master 31
  - chart paper for making calendars
- for each group of 12 children
  - old calendar, separated into pages

Lesson

1

Gather the children around the working area for a discussion of seasons. Display the calendar for the current year.

What season of the year do you like best, Maggie? Why? What kind of weather do we get during that season? How long does the season last? Let's list the months on the easel.

Write on the easel, for example,

Spring

March April May

Repeat the discussion until all the seasons and corresponding months have been recorded on the easel.

What is the first month of the year Jeanette? What is the second month, Arnold?

Record the months in order on the easel.

What season of the year comes first, Nanette? What season comes next, Roy?

List the seasons in order on the easel.

How many months are there in the year, David? Count them, please. How many seasons are there?

2

Discuss special dates. On what date is Christmas, Hallowe'en, Easter and so on? Children from other cultures can contribute interesting holiday dates. Each time a date is mentioned, have the child locate it on the calendar and tell on what day of the week for the particular year the holiday falls. Then have each child in the group point out the date of his or her birthday and name the day of the week for that year.

3

Ask several questions such as the following:

What is the month before July?
What is the day after Wednesday?
What is the last month in the year?
What is the first month of spring?
What is the last month of autumn?

When the pattern has been established, invite each child to ask a question and appoint the child who is to answer.

What month comes after Hallowe'en, Joe?

4

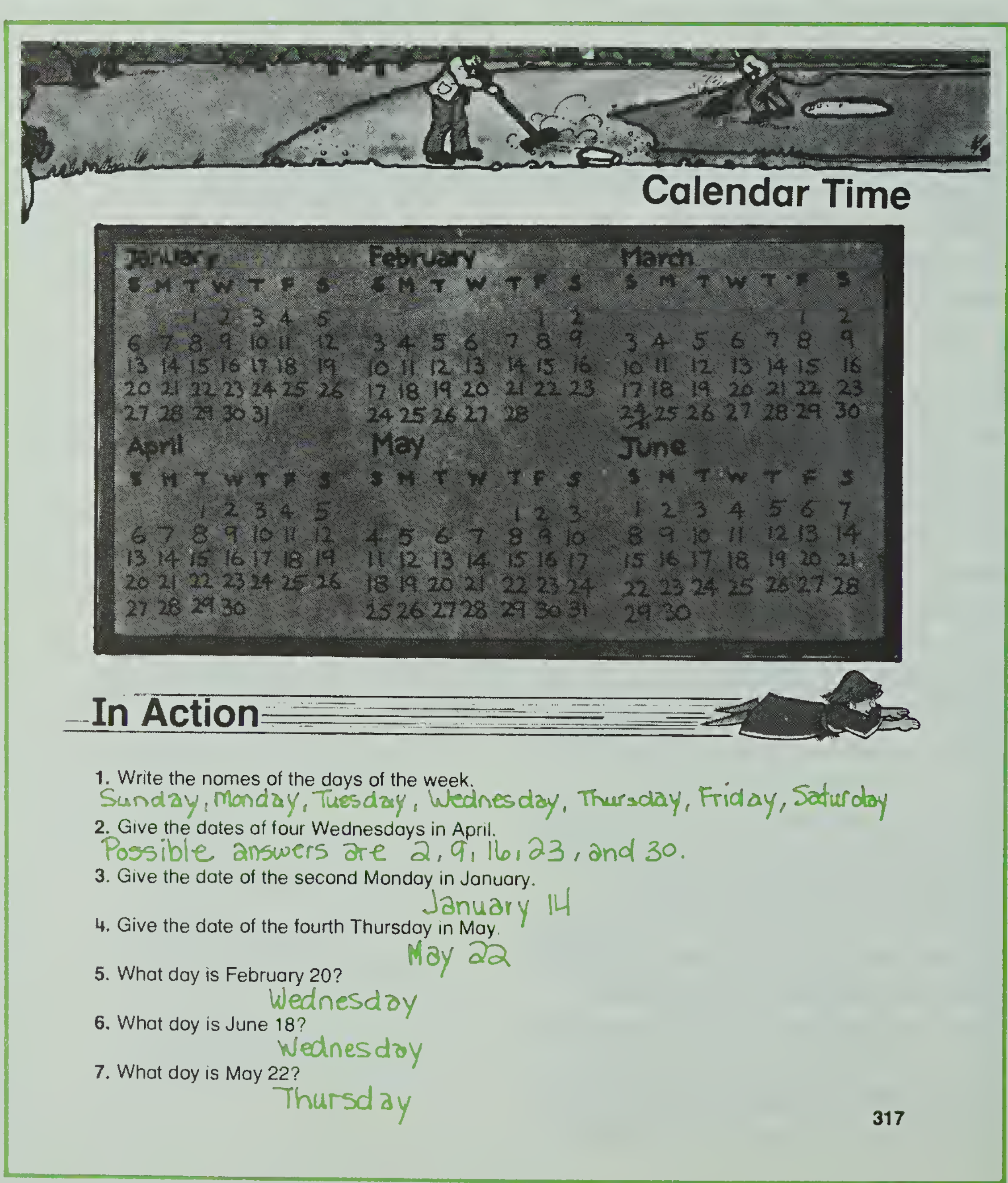
Have a child locate the current date on the current month's calendar and record it on the easel.

Friday, June 1

Ask

What was the date yesterday?
What will the date be tomorrow?
What will the date be on the last day of this month?
How many Wednesdays are there in this month? On what dates do they fall? What kind of weather do you expect on each of the Wednesdays in June?

Encourage the children to look at the display calendar if they have trouble locating the date on the appropriate



Calendar Time

January

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

February

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		

March

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24/31	25	26	27	28	29	30

April

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

May

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

June

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

In Action

1. Write the names of the days of the week.
Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
2. Give the dates of four Wednesdays in April.
Possible answers are 2, 9, 16, 23, and 30.
3. Give the date of the second Monday in January.
January 14
4. Give the date of the fourth Thursday in May.
May 22
5. What day is February 20?
Wednesday
6. What day is June 18?
Wednesday
7. What day is May 22?
Thursday

week day when changing months, for example from Tuesday, January 31 to Wednesday, February 1. As the children work, circulate among them to help solve any problems they may be having.

Alternatively, divide the class into groups of 12. Have each group prepare an illustrated calendar for the current year. Each group member prepares a calendar, and coloured or painted picture for one month, the pictures are assembled, a cover giving the year is attached and the calendars prepared by all the groups are displayed in the classroom. Discuss with each group themes that would be appropriate for the illustrations.

Written and Other Activities

☐

mathways 3, pages 317, 318

Discuss the calendars shown at the top of each page, asking children to locate days of special significance to them or their families: birthdays, vacations, special outings, etc. Do the first few In Action questions together, if it seems desirable, and offer to help with questions the children find difficult.

☐ ☐

Give each child a large sheet of chart paper on which to make a calendar for the current year. If the children wish, allow them to make a separate calendar page for each month (duplicated from Program Master 31) and draw a picture indicating the weather. Start them off by writing on the easel the months of the year and the number of days in each, and the weekday that January 1 falls on.

☐ ☐ ☐

Divide the class into groups of 12. Give each group an old calendar separated into pages to distribute among the members. Each child tells something about the month he or she has been given. For example, a child may notice that there are five Wednesdays but only four Fridays; another may mention that the month starts on a Tuesday and ends on a Sunday; another may say that the weekday on which a birthday falls in the assigned month is different than the weekday for the same date mentioned for a different month.

☐ ☐ ☐ ☐

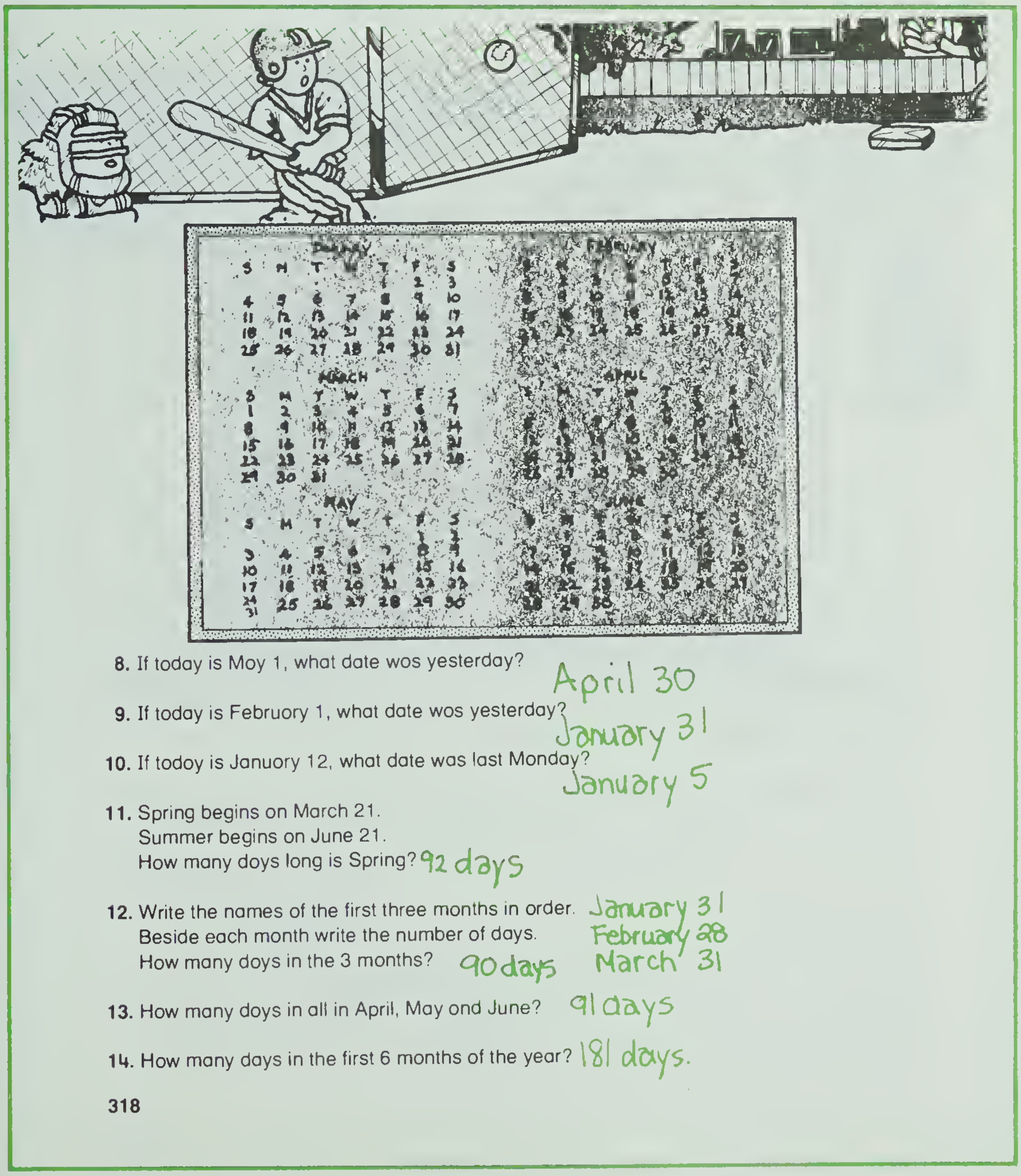
Have each child start a journal for keeping track of the daily weather during the month. The child lists the weekday and date for each day in the coming month in a notebook. Every day, the child fills in the high and low temperature and describes the weather.

Wednesday, June 8.
High *Low*
18°C 12°C
Rainy in the morning
Hot and breezy in the afternoon

Offer to help if the children have trouble writing weather descriptions.

☐ ☐ ☐ ☐ ☐

In preparation for the problem solving on page 321, invite the children to bring in materials for growing plants in the classroom. This might be done as a group activity in which several seeds are planted in a large container, or the children can grow individual plants in small pots. Each child should become involved in recording the planting date and daily or weekly growth reports. The activity might be keyed to a science project, in which case other variables might be included on the records.



8. If today is May 1, what date was yesterday? April 30

9. If today is February 1, what date was yesterday? January 31

10. If today is January 12, what date was last Monday? January 5

11. Spring begins on March 21.
Summer begins on June 21.
How many days long is Spring? 92 days

12. Write the names of the first three months in order. January 31
Beside each month write the number of days. February 28
How many days in the 3 months? 90 days March 31

13. How many days in all in April, May and June? 91 days

14. How many days in the first 6 months of the year? 181 days.

318

Unit 4 Section 6 Lesson 5

Writing Dates, Solving Word Problems

Materials

- display-size calendar of the current year
- several old calendars brought from home in advance
- for each child
  - – calendar prepared for previous lesson
- recent edition of *Quick Canadian Facts* (Toronto: Quick Canadian Facts Ltd.)

Lesson

1

Invite all the children who have a birthday in January to stand up. Have these children record their birthdates on the blackboard. Repeat the instruction for each month in the year. Often, the children discover a classmate or two born on the same day, in the same year or in a different year.

2

Divide the class into groups and give a current calendar and an old calendar to each group. The children locate and record their respective birthdays in each year, giving the weekday, the month and the year. Discuss the activity. Were there any differences to be noted? Were any of the children born on February 29? If so, how do they celebrate in leap years and in the years between?

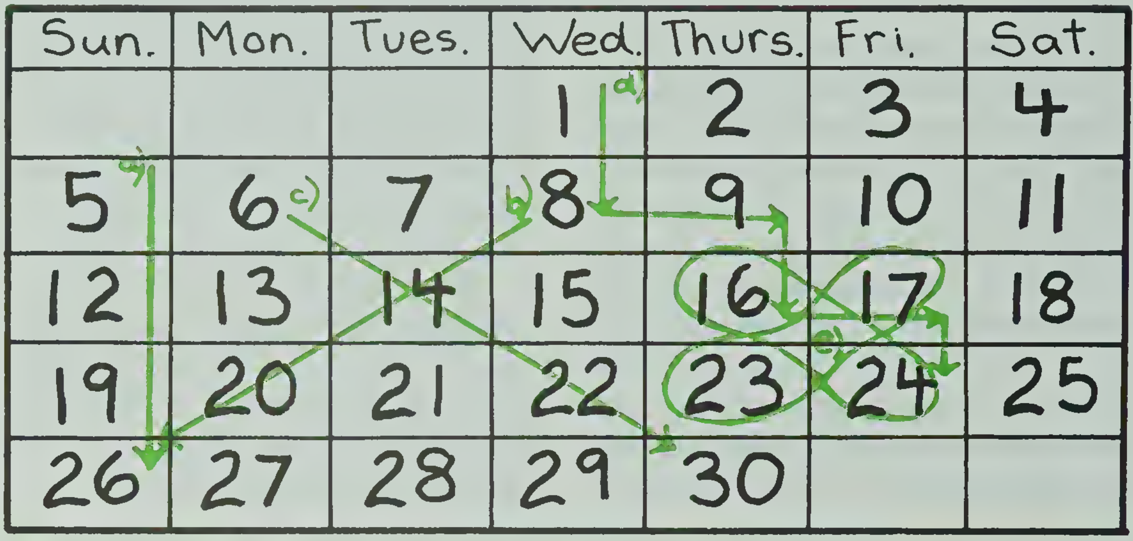
3

Place a number of old calendars in the centre of the working area. Have the children order them according to years and compare them for similarities and differences. Discuss the activity, encouraging children to report any pattern they may have noticed. For example, if March 1 occurred on a Friday two years ago, on a Saturday last year and on a Sunday this year, on what day is it likely to occur next year?

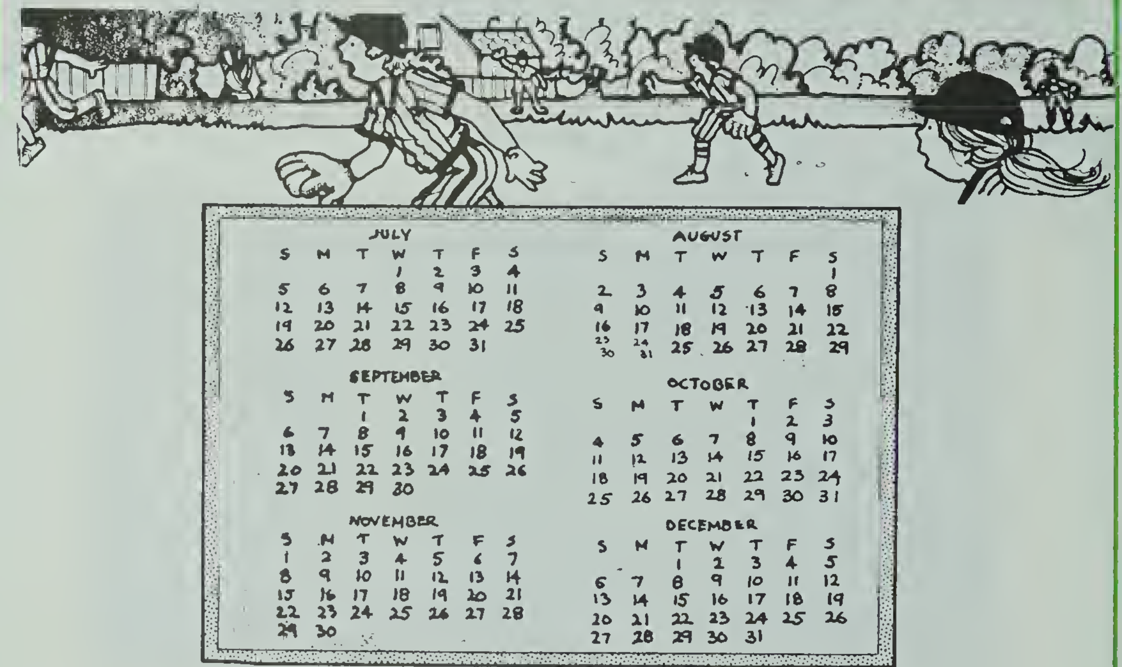
4

Have each child examine the calendar prepared during the previous day's lesson and report any interesting patterns that can be shown by drawing lines according to a rule. For example, here are some adding rules and the patterns they result in:

Although the rules governing these patterns involve only addition, interesting patterns can result from rules involving subtraction as well.



Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		



JULY

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

AUGUST

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23 30	24 31	25	26	27	28	29

SEPTEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

OCTOBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

NOVEMBER

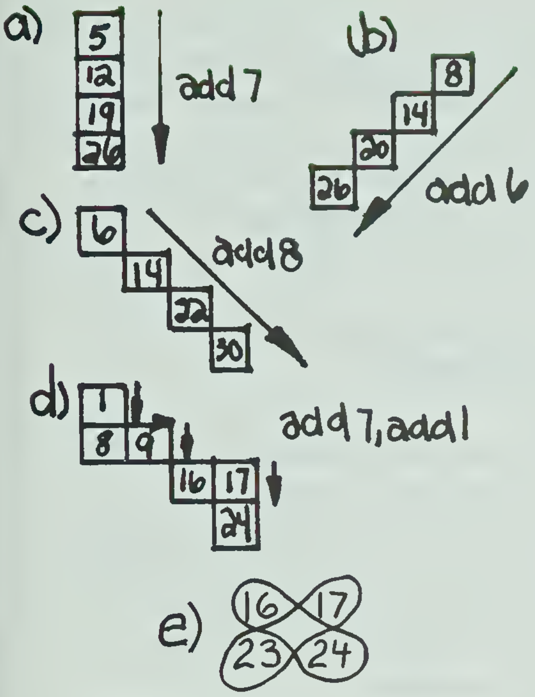
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

DECEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

In Action

1. Write the date of your birthday. Answers will vary
2. Write the date of a friend's birthday. Answers will vary
3. Write the date of the birthday of a member of your family. Answers will vary
4. How many days in all in July, August and September? 92 days
5. How many days in all in October, November and December? 92 days
6. How many days in the last 6 months of the year? 184 days
7. How many days in the whole year? 365 days
8. How many months are in the year? 12 months



23+17=40 16+24=40

Written and Other Activities

☐

mathways 3, pages 319, 320

Have children read the problems aloud. Discuss ways that these problems might be solved. Explain the symbol for day, d, before assigning the In Action problems.

☐ ☐

Have each child list 10 important dates in the current year. These will vary, reflecting the children's interests and circumstances. Use the lists as the starting point for discussions about interesting events and to frame problems. For example

How many days between Christmas and the day the swimming pool opens?

How many months and days till your mother's birthday?

How many months and days have passed since the zoo opened for the season?

Discuss whether adding, counting or subtracting is appropriate in each case. Then, using the children's lists as a base, list several significant events past or still to come in the current year on the easel.

September 5, 1984, School opens
October 15, 1984, Fall Fair opens
•
•
August 15, 1985, Trip to the zoo
September 4, 1985, Last day of summer vacation

Divide the children into groups and give each group last year's and this year's calendar. The children ask each other questions based on the information on the easel. Visit each group and pose a word problem or participate in answering a problem posed by a child.

☐ ☐ ☐

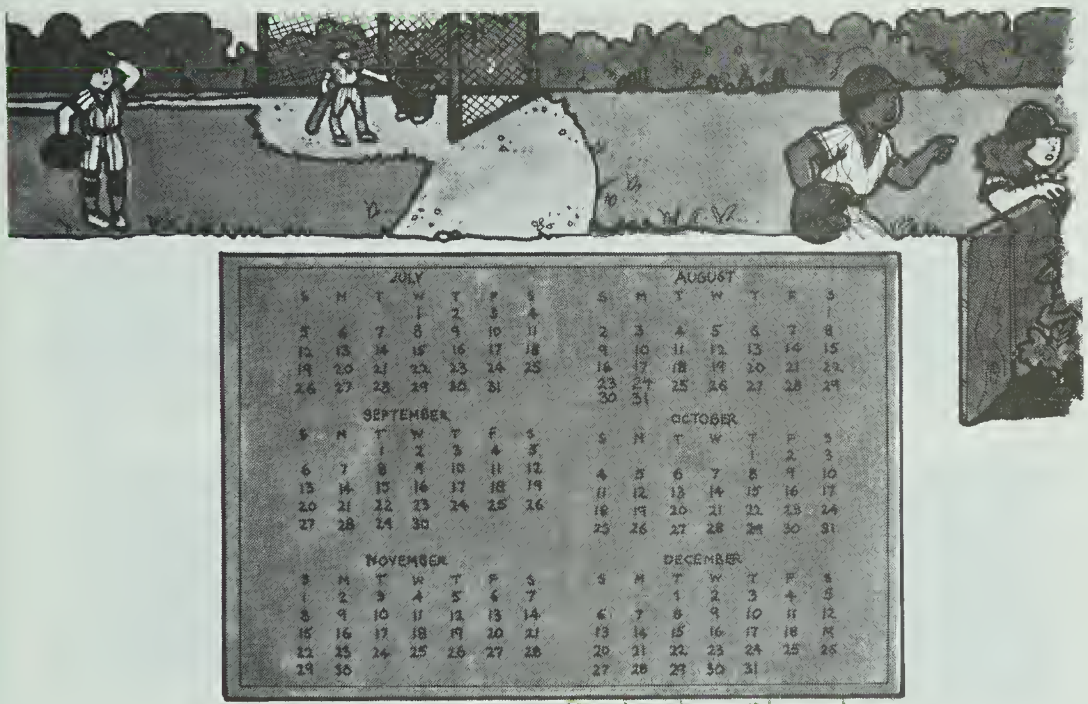
Using information adapted from *Quick Canadian Facts* or a similar book, cite some interesting historical facts. For example,

In 1874, the telephone was invented by Alexander Graham Bell? How many years ago was that? How can we find out? Write the subtraction question on the easel please, Marvin, then subtract to find the answer.

Invite the children to research the dates for important community events. For example:

– the date the library opened
– the arrival of the first settler
– the building of the first school
– the first year the rodeo or carnival was held

The children may enjoy working in pairs for this activity. Give them suggestions for interviews or books, etc., that would help them get the information required.



9. Write the names of the months with 30 d. September, November

10. Write the names of the months with 31 d. July, August, October, December

11. Jane's birthday is October 18. Barry's is 10 d later. What day is Barry's birthday?
What date is Barry's birthday? October 28

12. Summer begins June 21.
Fall begins September 21.
Winter begins December 21.
Spring begins March 21.
How many days long is summer? 92 days
How many days long is fall? 91 days
How many days long is winter? 90 days
How many days long is spring? 92 days.

Unit 4 Section 6 Lesson 6

Solving Word Problems

Materials

- display-size calendar for June, July and August
- for each child
  - current calendar completed during previous lessons
  - sheet of graph paper reproduced from Program Master 5
- for each group
  - seed catalogue
  - seed packages

Lesson

1

Gather the children around the working area for a discussion of gardening. Some children will have had experiences with growing plants in or out of doors, and some may have helped plant and tend vegetable gardens. Probably, the children have noticed seed displays in stores. Encourage the children to relate their experiences and tell what conditions are required before plants can grow: air, moisture, light and warmth. Ask various children how long it took the seeds they plant to appear above ground, how long from germination till the plants were ready to harvest and so on.

2

Display the calendar for June, July and August explaining that these are the months in which plants in Canada grow most rapidly, though in other parts of the world plants grow all year long. Hold up an empty package of radish seeds.

Radish seeds take 24 days to grow into radishes that are ready to eat. If the seeds are planted on June 3, on what date will the radishes be ready for eating?

Invite a child to count the days on the display calendar. Then ask

If the radish seeds are planted on June 10, when will they be ready to eat?

If the radish seeds are planted July 24, when will they be ready?

Have a child count the days on the calendar. Note the transition from June to July and have a child record the planting date and the maturity date on the easel. Ask several similar questions, but this time have the children use their own calendars to find the answers. Then, to verify the dates, demonstrate on the display calendar.

3

Have the children form small groups. Give each group a seed catalogue and several empty or full seed packages. Allow time for the children to examine the materials for information about the length of growing time for the various vegetables. As the children work, visit each group and ask questions such as *What's your favourite vegetable, Aislin? How many days will it take to grow till its ready to eat? When should you plant the seeds? What other vegetables would you like to grow?*

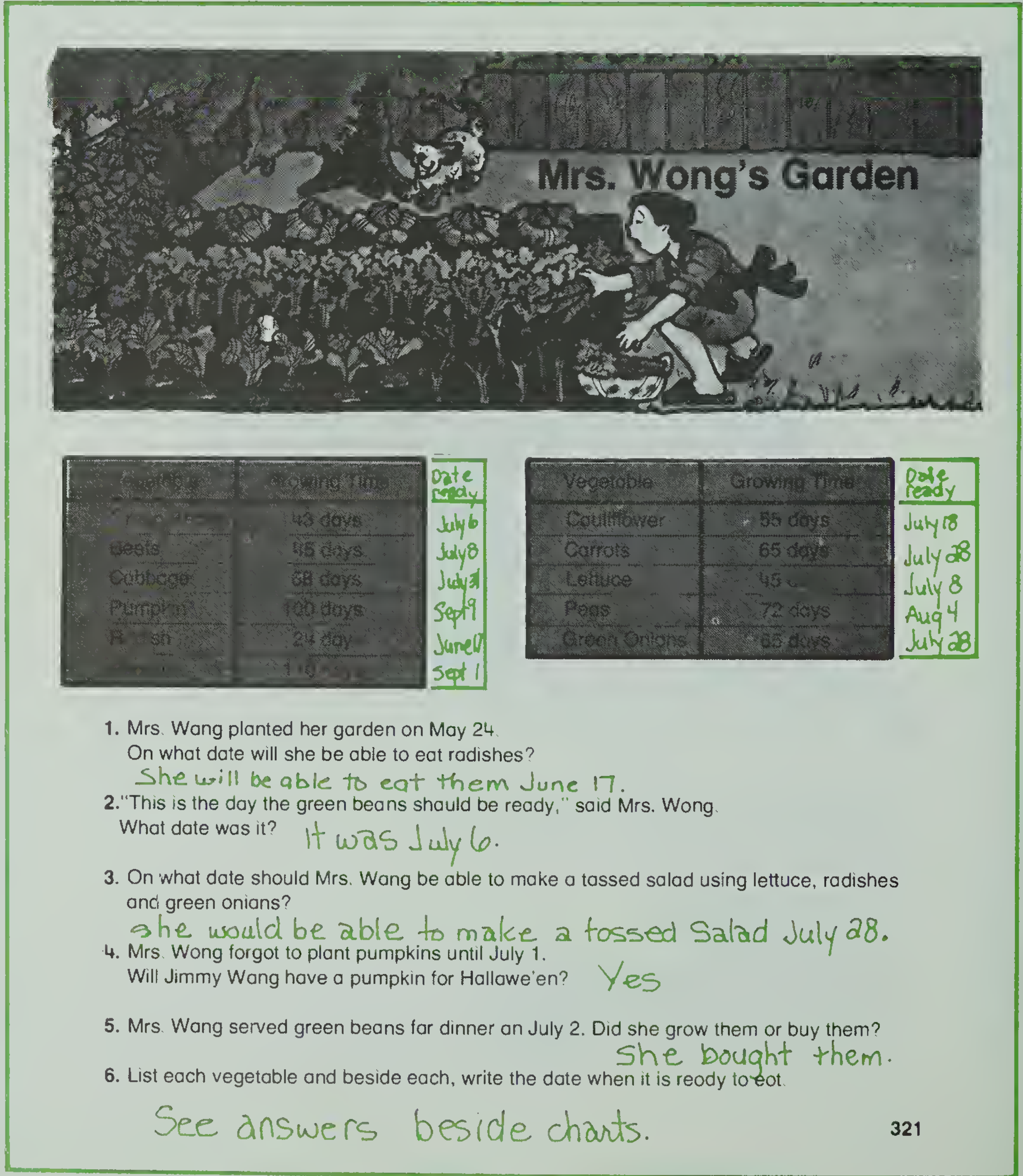
Have the children put the seed packages and catalogues on the table in the activity centre.

Written and Other Activities

☐

mathways 3, page 321

Discuss the chart, then have children read the problems aloud to make sure that they understand all the words. Encourage them to use their calendars to solve the problems.



Mrs. Wong's Garden

Vegetable	Growing Time	Date ready
[illegible]	43 days	July 6
Beets	45 days	July 8
Cabbage	68 days	July 31
Pumpkin	100 days	Sept 9
Radish	24 days	June 17
[illegible]	[illegible]	Sept 1

Vegetable	Growing Time	Date ready
Cauliflower	55 days	July 18
Carrots	65 days	July 28
Lettuce	45 [illegible]	July 8
Peas	72 days	Aug 4
Green Onions	65 days	July 28

1. Mrs. Wong planted her garden on May 24. On what date will she be able to eat radishes?
   She will be able to eat them June 17.
2. "This is the day the green beans should be ready," said Mrs. Wong. What date was it? It was July 6.
3. On what date should Mrs. Wong be able to make a tossed salad using lettuce, radishes and green onions?
   she would be able to make a tossed Salad July 28.
4. Mrs. Wong forgot to plant pumpkins until July 1. Will Jimmy Wong have a pumpkin for Hallowe'en? Yes
5. Mrs. Wong served green beans for dinner on July 2. Did she grow them or buy them?
   She bought them.
6. List each vegetable and beside each, write the date when it is ready to eat.
   See answers beside charts.

321

Further Practice Unit 1

Add.

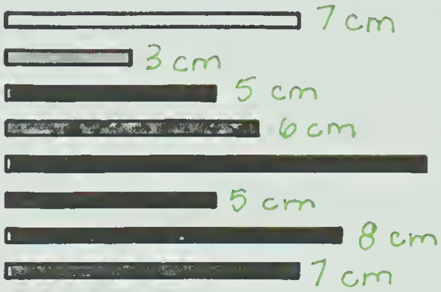
1. 4 + 7 11	2. 3 + 8 11	3. 6 + 7 13	4. 7 + 5 12	5. 8 + 4 12	6. 9 + 5 14	7. 7 + 6 13	8. 5 + 7 12
9. 7 + 7 14	10. 6 + 8 14	11. 8 + 8 16	12. 9 + 7 16	13. 0 + 8 8	14. 2 + 9 11	15. 7 + 8 15	16. 6 + 5 11
17. 8 + 6 14	18. 7 + 0 7	19. 6 + 6 12	20. 8 + 9 17	21. 9 + 9 18	22. 9 + 6 15	23. 5 + 9 14	24. 3 + 9 12
25. 5 + 8 13	26. 9 + 4 13	27. 13 + 0 13	28. 9 + 2 11	29. 12 + 1 13	30. 8 + 5 13	31. 4 + 8 12	32. 0 + 11 11
33. 7 + 4 11	34. 9 + 3 12	35. 9 + 8 17	36. 8 + 3 11	37. 7 + 9 16	38. 5 + 6 11	39. 6 + 9 15	40. 4 + 9 13

Subtract.

41. 9 − 4 5	42. 11 − 3 8	43. 15 − 6 9	44. 12 − 4 8	45. 15 − 7 8	46. 8 − 3 5	47. 17 − 8 9	48. 11 − 6 5
49. 10 − 7 3	50. 18 − 9 9	51. 9 − 7 2	52. 11 − 4 7	53. 16 − 9 7	54. 12 − 8 6	55. 12 − 7 5	56. 14 − 8 6
57. 14 − 7 7	58. 13 − 8 5	59. 13 − 7 6	60. 11 − 7 4	61. 16 − 7 9	62. 11 − 2 9	63. 14 − 5 9	64. 15 − 9 6
65. 13 − 5 8	66. 12 − 6 6	67. 15 − 8 7	68. 12 − 5 7	69. 14 − 6 8	70. 16 − 8 8	71. 13 − 9 4	72. 13 − 4 9
73. 11 − 5 6	74. 11 − 8 3	75. 14 − 9 5	76. 11 − 9 2	77. 11 − 11 0	78. 13 − 6 7	79. 15 − 15 0	80. 17 − 9 8

Further Practice Unit 1

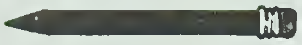
How many centimetres long is each?



1. 7 cm
2. 3 cm
3. 5 cm
4. 6 cm
5. 10 cm
6. 5 cm
7. 8 cm
8. 7 cm

How much money?

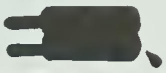
9. 10¢ 10¢ 5¢ 1¢ 26¢



10. 25¢ 25¢ 25¢ 1¢ 76¢

11. 10¢ 5¢ 25¢ 1¢ 41¢

12. 5¢ 5¢ 5¢ 1¢ 1¢ 1¢ 18¢

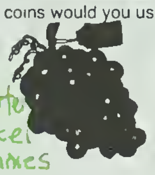


13. 25¢ 10¢ 10¢ 5¢ 5¢ 1¢ 56¢

14. 50¢ 5¢ 10¢ 1¢ 25¢ 91¢

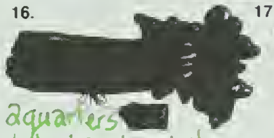
What coins would you use to buy these?

15.



3 quarters
1 nickel
3 pennies

16.



2 quarters
1 dime, 1 nickel
4 pennies

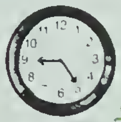
17.

3 quarters
1 dime 1 nickel
2 pennies

Further Practice Unit 1

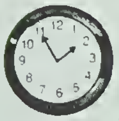
Write each time 2 ways

1.



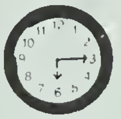
9:25
nine
twenty-five

2.



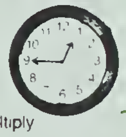
1:55
one
fifty-five

3.



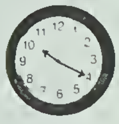
6:15
six
fifteen

4.



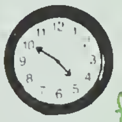
12:45
twelve
forty-five

5.



10:20
ten
twenty

6.



4:50
four
fifty

Multiply

7. 2 × 2 4	8. 4 × 0 0	9. 3 × 1 3	10. 3 × 5 15	11. 2 × 1 2	12. 0 × 3 0	13. 1 × 4 4
14. 2 × 3 6	15. 1 × 1 1	16. 5 × 5 25	17. 3 × 2 6	18. 1 × 2 2	19. 1 × 5 5	20. 4 × 5 20
21. 2 × 5 10	22. 4 × 1 4	23. 2 × 0 0	24. 5 × 4 20	25. 2 × 4 8	26. 4 × 2 8	27. 5 × 2 10
28. 1 × 3 3	29. 3 × 3 9	30. 4 × 3 12	31. 3 × 4 12	32. 5 × 3 15	33. 5 × 1 5	34. 4 × 4 16

Divide.

35. 5 ÷ 5 = 1 36. 20 ÷ 4 = 5 37. 12 ÷ 3 = 4 38. 8 ÷ 4 = 2 39. 3 ÷ 1 = 3
40. 25 ÷ 5 = 5 41. 4 ÷ 4 = 1 42. 15 ÷ 5 = 3 43. 15 ÷ 3 = 5 44. 12 ÷ 4 = 3
45. 5 ÷ 1 = 5 46. 16 ÷ 4 = 4 47. 10 ÷ 5 = 2 48. 2 ÷ 2 = 1 49. 10 ÷ 2 = 5
50. 20 ÷ 5 = 4 51. 4 ÷ 1 = 4 52. 9 ÷ 3 = 3 53. 8 ÷ 2 = 4 54. 2 ÷ 1 = 2

Further Practice Unit 1

Write the numeral.

1. 4 tens and 7 47 2. 5 tens and 6 56 3. 9 tens and 0 90 4. 7 tens and 5 75
5. 3 tens and 9 39 6. 1 ten and 0 10 7. 8 tens and 1 81 8. 2 tens and 2 22

Write the number of tens and ones.

9. 19 1 ten + 9	10. 68 6 tens + 8	11. 30 3 tens	12. 84 8 tens + 4	13. 35 3 tens + 5	14. 99 9 tens + 9	15. 47 4 tens + 7
16. 79 7 tens + 9	17. 97 9 tens + 7	18. 23 2 tens + 3	19. 40 4 tens	20. 75 7 tens + 5	21. 50 5 tens	22. 18 ten + 8

Complete the counting.

23. 87, 88, 89 90, 91, 92, 93, 94, 95 24. 52, 53, 54 55, 56, 57, 58, 59, 60

25. 75, 76, 77 78, 79, 80, 81, 82, 83

Write the numeral before

26. 39 40 27. 58 59 28. 16 17 29. 98 99 30. 31 32
31. 50 51 32. 59 60 33. 87 88 34. 99 100 35. 28 29

Write the numeral after

36. 39, 40 37. 20, 21 38. 52, 53 39. 60, 61 40. 89, 90
41. 70, 71 42. 61, 62 43. 59, 60 44. 75, 76 45. 91, 92

Write the numeral between

46. 59, 60 61 47. 32, 33 34 48. 52, 53 54 49. 60, 61 62
50. 47, 48 49 51. 23, 24 25 52. 87, 88 89 53. 68, 69 70

Write the numeral to show 2 more than

54. 4 tens and 8 50 55. 2 tens and 5 27 56. 7 tens and 0 72 57. 5 tens and 3 55

Write the numeral to show 2 less than

58. 9 tens and 0 88 59. 4 tens and 1 39 60. 3 tens and 2 30 61. 7 tens and 4 72

Further Practice Unit 2

Add.

1. (9, 7) 16 2. (8, 5) 13 3. (6, 8) 14 4. (7, 3) 10 5. (11, 5) 16 6. (8, 3) 11
7. (7, 6) 13 8. (6, 4) 10 9. (9, 6) 15 10. (8, 7) 15 11. (9, 8) 17 12. (8, 6) 14

Subtract.

13. (13, 7) 6 14. (15, 9) 6 15. (17, 8) 9 16. (14, 6) 8 17. (16, 9) 7 18. (15, 6) 9
19. (17, 9) 8 20. (15, 7) 8 21. (15, 8) 7 22. (13, 6) 7 23. (13, 8) 5 24. (12, 7) 5

25. Write 10 number pairs for 14.
Use addition. example (1,13)

26. Write 10 number pairs for 11.
Use addition. example (1,10)

27. Write 10 number pairs for 7.
Use subtraction. example (16,9)

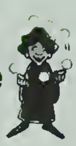
28. Write 10 number pairs for 5.
Use subtraction. example (15,10)

Complete.

29.	30.	31.	32.
8 + 3 = 11	92 − 9 = 83	7 + 6 = 13	2 + 9 = 11
18 + 3 = 21	82 − 9 = 73	17 + 6 = 23	12 + 9 = 21
28 + 3 = 31	72 − 9 = 63	27 + 6 = 33	22 + 9 = 31
38 + 3 = 41	62 − 9 = 53	37 + 6 = 43	32 + 9 = 41
48 + 3 = 51	52 − 9 = 43	47 + 6 = 53	42 + 9 = 51
58 + 3 = 61	42 − 9 = 33	57 + 6 = 63	52 + 9 = 61
68 + 3 = 71	32 − 9 = 23	67 + 6 = 73	62 + 9 = 71
78 + 3 = 81	22 − 9 = 13	77 + 6 = 83	72 + 9 = 81
88 + 3 = 91	12 − 9 = 3	87 + 6 = 93	82 + 9 = 91
98 + 3 = 101		97 + 6 = 103	92 + 9 = 101

33.	34.	35.	36.
5 + 4 = 9	93 − 7 = 86	6 + 5 = 11	98 − 9 = 89
15 + 4 = 19	83 − 7 = 76	16 + 5 = 21	88 − 9 = 79
25 + 4 = 29	73 − 7 = 66	26 + 5 = 31	78 − 9 = 69
35 + 4 = 39	63 − 7 = 56	36 + 5 = 41	68 − 9 = 59
45 + 4 = 49	53 − 7 = 46	46 + 5 = 51	58 − 9 = 49
55 + 4 = 59	43 − 7 = 36	56 + 5 = 61	48 − 9 = 39
65 + 4 = 69	33 − 7 = 26	66 + 5 = 71	38 − 9 = 29
75 + 4 = 79	23 − 7 = 16	76 + 5 = 81	28 − 9 = 19
85 + 4 = 89	13 − 7 = 6	86 + 5 = 91	18 − 9 = 9
95 + 4 = 99		96 + 5 = 101	

Further Practice Unit 2



Write the numeral.

1. 2 hundreds 7 tens and 5 275
2. 8 hundreds 9 tens and 2 892
3. 6 hundreds 0 tens and 0 600
4. 7 hundreds 7 tens and 7 777
5. 3 hundreds 5 tens and 0 350
6. 5 hundreds 3 tens and 1 531

Write the number of hundreds, tens and ones.

7. 658
8. 167
9. 393
10. 300
11. 507
12. 220
13. 591
14. 406
15. 285
16. 850

See Teachers Notes page 372 for answers

Complete the counting.

17. 200, 201, 202, 203, 204 205, 206, 207, 208
18. 697, 698, 699, 700, 701, 702, 703, 704, 705
19. 327, 328, 329, 330, 331, 332, 333, 334, 335
20. 496, 497, 498, 499, 500, 501, 502, 503, 504

Write the numerals before and after

21. 599 600, 601
22. 361 362, 363
23. 439 440, 441
24. 734 735, 736
25. 398 399, 400
26. 899 900, 901
27. 798 799, 800
28. 669 670, 671

Write the numeral between

29. 299, 300, 301
30. 423, 424 425
31. 655, 656, 657
32. 200, 201, 202
33. 800, 801 802
34. 321, 322 323
35. 199, 200 201
36. 419, 420 421

Write the numeral 1 greater than

37. 3 hundreds 0 tens and 9 310
38. 8 hundreds 1 ten and 9 820
39. 7 hundreds 9 tens and 9 800
40. 4 hundreds 2 tens and 2 423

Write the numeral 1 less than

41. 9 hundreds 7 tens and 3 972
42. 6 hundreds 0 tens and 0 599
43. 3 hundreds 2 tens and 1 320
44. 8 hundreds 7 tens and 0 869

Further practice Unit 2

Add.

1.	2.	3.	4.	5.	6.
56	38	69	26	17	46
+ 7	+ 9	+ 3	+ 5	+ 8	+ 4
63	47	72	31	25	50

7.	8.	9.	10.	11.	12.
28	58	27	87	59	34
+ 6	+ 3	+ 7	+ 5	+ 2	+ 9
34	61	34	92	61	43

Expand. Add. Make the exchange.

13.	14.	15.	16.	17.	18.
36	48	29	35	29	18
+ 24	+ 44	+ 62	+ 27	+ 45	+ 45
60	92	91	62	74	63

19.	20.	21.	22.	23.	24.
26	56	58	75	43	35
+ 57	+ 25	+ 18	+ 16	+ 17	+ 55
83	81	76	91	60	90

Subtract.

25.	26.	27.	28.	29.	30.
55	38	54	32	61	37
− 6	− 9	− 7	− 8	− 9	− 9
49	29	47	24	52	28

31.	32.	33.	34.	35.	36.
38	22	53	46	75	46
− 8	− 9	− 7	− 7	− 8	− 8
30	13	46	39	67	38

Expand. Subtract. Make the exchange.

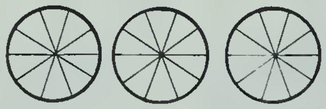
37.	38.	39.	40.	41.	42.
62	91	36	65	81	72
− 29	− 33	− 19	− 48	− 57	− 34
33	58	17	17	24	38

43.	44.	45.	46.	47.	48.
63	31	82	43	95	53
− 27	− 16	− 36	− 26	− 47	− 26
36	15	46	17	48	27

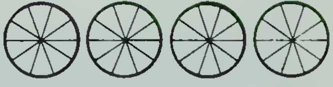
Further Practice Unit 2

Write a decimal for each picture.

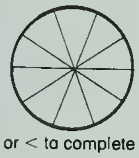
1. 2.4



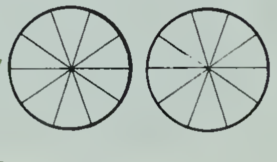
2. 3.6



3. 0.8



4. 1.7



Use > or < to complete each sentence.

5. 0.4 ☐ 0.8 <
6. 0.3 ☐ 0.1 >
7. 0.5 ☐ 0.2 >
8. 1.4 ☐ 1.2 >
9. 0.9 ☐ 0.4 >
10. 0.7 ☐ 0.8 <
11. 0.1 ☐ 0.9 <
12. 2.5 ☐ 1.1 >

Add.

13.	14.	15.	16.	17.	18.
0.4	0.6	0.7	0.5	0.1	0.4
+ 0.3	+ 0.1	+ 0.2	+ 0.3	+ 0.8	+ 0.4
0.7	0.7	0.9	0.8	0.9	0.8

19.	20.	21.	22.	23.	24.
0.1	0.2	0.3	0.2	0.4	0.3
0.3	0.1	0.1	0.2	0.1	0.3
+ 0.2	+ 0.4	+ 0.1	+ 0.2	+ 0.2	+ 0.3
0.6	0.7	0.5	0.6	0.7	0.9

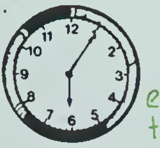
Subtract.

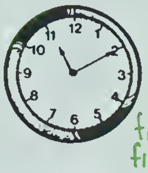
25.	26.	27.	28.	29.	30.
0.7	0.5	0.9	0.7	0.6	0.8
− 0.4	− 0.4	− 0.8	− 0.3	− 0.5	− 0.7
0.3	0.1	0.1	0.4	0.1	0.1

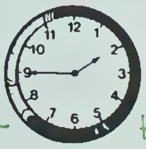
31.	32.	33.	34.	35.	36.
0.9	0.8	0.4	0.6	0.7	0.5
− 0.4	− 0.1	− 0.4	− 0.3	− 0.2	− 0.2
0.5	0.7	0.0	0.3	0.5	0.3

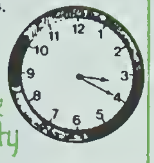
Further Practice Unit 3

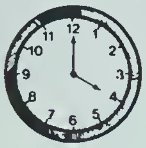
Write each time 2 ways.

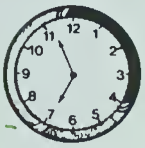
1.

6.05
six-
o- five

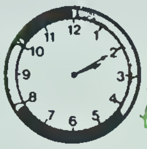
2.

11:10
eleven
ten

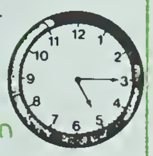
3.

1:45
one
forty-
five

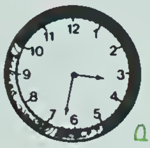
4.

3:20
three
twenty

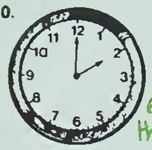
5.

4:00
four -
o'clock

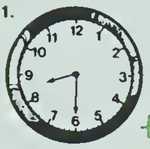
6.

6:55
six
fifty-
five

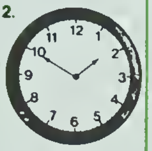
7.

2:10
two
ten

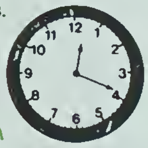
8.

5:15
five
fifteen

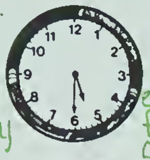
9.

3:33
three
thirty-
three

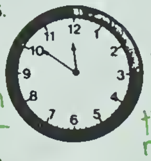
10.

2:00
two
o'clock

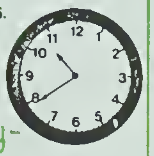
11.

8:30
eight
thirty

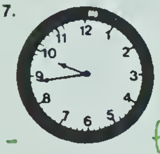
12.

1:50
one
fifty

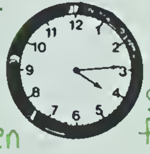
13.

12:19
twelve
ninteen

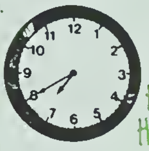
14.

5:30
five
thirty

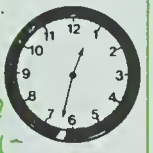
15.

11:51
eleven
fifty-
one

16.

10:39
ten
thirty-
nine

17.

9:44
nine
forty-
four

18.

4:14
four
fourteen

19.

7:40
seven
forty

20.

12:33
twelve
thirty-
three

Further Practice Unit 3

Multiply

1. 7 × 1 = 7
2. 6 × 2 = 12
3. 8 × 4 = 32
4. 9 × 7 = 63
5. 7 × 6 = 42
6. 9 × 8 = 72
7. 8 × 5 = 40
8. 9 × 3 = 27
9. 7 × 4 = 28
10. 8 × 8 = 64
11. 8 × 2 = 16
12. 6 × 3 = 18
13. 8 × 0 = 0
14. 5 × 7 35
15. 6 × 4 24

16.	17.	18.	19.	20.	21.	22.
8	9	6	7	6	6	8
× 9	× 2	× 5	× 3	× 6	× 9	× 7
72	18	30	21	36	54	56

23.	24.	25.	26.	27.	28.	29.
7	7	8	9	6	9	6
× 0	× 7	× 3	× 4	× 7	× 6	× 8
0	49	24	36	42	54	48

30.	31.	32.	33.	34.	35.	36.
8	9	6	7	8	7	9
× 1	× 5	× 1	× 8	× 6	× 5	× 9
8	45	6	56	48	35	81

Divide.

37. 72 ÷ 8 = 9
38. 81 ÷ 9 = 9
39. 32 ÷ 8 = 4
40. 35 ÷ 5 = 7
41. 40 ÷ 5 = 8
42. 64 ÷ 8 = 8
43. 63 ÷ 7 = 9
44. 54 ÷ 6 = 9
45. 56 ÷ 8 = 7
46. 36 ÷ 4 = 9
47. 27 ÷ 3 = 9
48. 45 ÷ 9 = 5
49. 42 ÷ 6 = 7
50. 28 ÷ 7 = 4
51. 21 ÷ 3 = 7
52. 56 ÷ 7 = 8
53. 49 ÷ 7 = 7
54. 72 ÷ 9 = 8
55. 36 ÷ 9 = 4
56. 48 ÷ 8 = 6
57. 27 ÷ 9 = 3
58. 32 ÷ 4 = 8
59. 35 ÷ 7 = 5
60. 28 ÷ 4 = 7
61. 24 ÷ 8 = 3
62. 48 ÷ 6 = 8
63. 42 ÷ 7 = 6
64. 40 ÷ 8 = 5
65. 45 ÷ 5 = 9
66. 21 ÷ 7 = 3
67. 63 ÷ 9 = 7
68. 54 ÷ 9 = 6
69. 24 ÷ 3 = 8
70. 30 ÷ 6 = 5
71. 24 ÷ 6 = 4

Further Practice Unit 3

Add. Use the expanded farm

1.	2.	3.	4.	5.	6.
235	265	735	453	527	346
+ 576	+ 617	+ 108	+ 319	+ 454	+ 756
811	882	843	772	981	1102

7.	8.	9.	10.	11.	12.
384	457	357	806	728	154
+ 366	+ 538	+ 228	+ 147	+ 235	+ 529
750	995	585	953	963	683

Add. Think the exchange.

13.	14.	15.	16.	17.	18.
468	728	647	737	562	636
+ 485	+ 176	+ 127	+ 189	+ 158	+ 285
953	904	774	926	720	921

19.	20.	21.	22.	23.	24.
483	618	834	329	657	746
+ 158	+ 268	+ 158	+ 585	+ 255	+ 138
641	886	992	914	912	884

25.	26.	27.	28.	29.	30.
478	362	483	675	567	396
+ 446	+ 259	+ 327	+ 315	+ 267	+ 477
924	621	810	990	834	873

Subtract Use the expanded form.

31.	32.	33.	34.	35.	36.
321	536	756	754	427	683
155	− 259	− 388	− 387	− 168	296
166	277	368	367	259	387

37.	38.	39.	40.	41.	42.
783	645	418	867	756	971
− 484	178	269	− 479	277	− 387
299	467	149	388	479	584

Subtract Think the exchange

43.	44.	45.	46.	47.	48.
731	525	942	654	863	421
− 484	− 187	− 265	− 468	− 167	− 186
247	338	677	186	696	235

49.	50.	51.	52.	53.	54.
651	742	625	975	613	425
− 287	− 268	− 419	− 342	258	172
364	474	206	633	355	253

Further Practice Unit 3

Write the numeral.

1. 15 tenths 1.5
2. 7 tenths 0.7
3. 21 tenths 2.1
4. 4 tenths 0.4
5. 36 tenths 3.6
6. 17 tenths 1.7
7. 29 tenths 2.9
8. 8 tenths 0.8
9. 11 tenths 1.1
10. 10 tenths 1.0

Write the meaning.

11. 2.3	12. 1.6	13. 3.1	14. 0.6	15. 2.1	16. 2.4
23 tenths	16 tenths	31 tenths	6 tenths	21 tenths	24 tenths
17. 4.3	**18.** 1.1	**19.** 2.9	**20.** 4.1	**21.** 6.2	**22.** 7.6
43 tenths	11 tenths	29 tenths	41 tenths	62 tenths	76 tenths

Add.

23.	24.	25.	26.	27.	28.
0.2	0.8	0.7	0.9	0.5	0.6
+ 0.9	+ 0.5	+ 0.6	+ 0.8	+ 0.4	+ 0.9
1.1	1.3	1.3	1.7	0.9	1.5

29.	30.	31.	32.	33.	34.
2.5	3.6	9.5	5.8	8.2	5.2
+ 1.8	+ 3.7	+ 2.6	+ 4.5	+ 8.3	+ 6.9
4.3	7.3	12.1	10.3	16.5	12.1

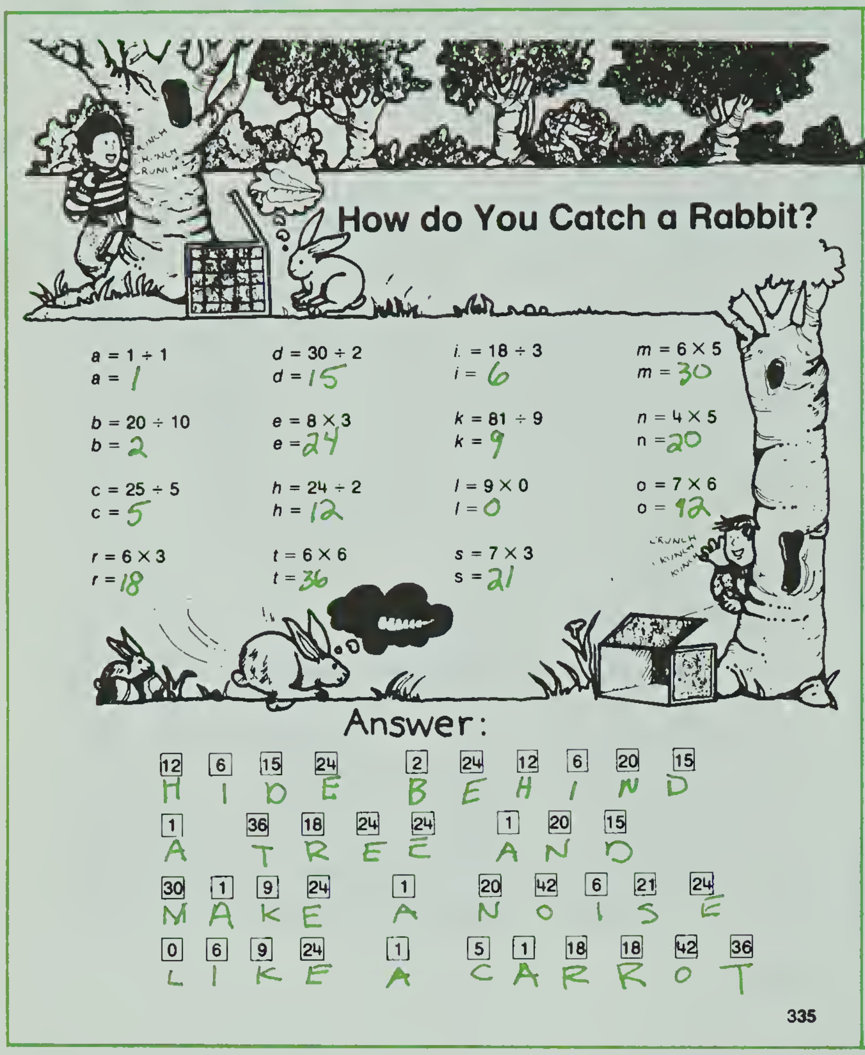
35.	36.	37.	38.	39.	40.
6.7	4.9	3.7	6.6	7.8	4.5
+ 5.8	+ 3.2	+ 5.4	+ 1.9	+ 2.6	+ 3.7
12.5	8.1	9.1	8.5	10.4	8.2

Subtract.

41.	42.	43.	44.	45.	46.
3 2	6.4	5.4	4.2	5.3	7.1
− 1.5	− 2.7	− 1.8	− 3.7	− 2.9	− 3.7
1.7	3.7	3.6	0.5	2.4	3.4

47.	48.	49.	50.	51.	52.
5.1	4.6	7.2	8.3	9.1	2.5
− 1.6	− 2.7	− 1.5	− 3.4	− 2.1	− 1.1
3.5	1.9	5.7	4.9	7.0	1.4

53.	54.	55.	56.	57.	58.
6.3	8.4	2.1	9.4	7.3	3.3
− 3.7	− 2.5	− 1.1	− 1.6	− 1.7	− 2.4
2.6	5.9	1.0	7.8	5.6	0.9



How do You Catch a Rabbit?

a = 1 ÷ 1
a = 1

b = 20 ÷ 10
b = 2

c = 25 ÷ 5
c = 5

r = 6 × 3
r = 18

d = 30 ÷ 2
d = 15

e = 8 × 3
e = 24

h = 24 ÷ 2
h = 12

t = 6 × 6
t = 36

i = 18 ÷ 3
i = 6

k = 81 ÷ 9
k = 9

l = 9 × 0
l = 0

s = 7 × 3
s = 21

m = 6 × 5
m = 30

n = 4 × 5
n = 20

o = 7 × 6
o = 42

Answer:

12 6 15 24 2 24 12 6 20 15
H I D E B E H I N D

1 36 18 24 24 1 20 15
A T R E E A N D

30 1 9 24 1 20 42 6 21 24
M A K E A N O I S E

0 6 9 24 1 5 1 18 18 42 36
L I K E A C A R R O T

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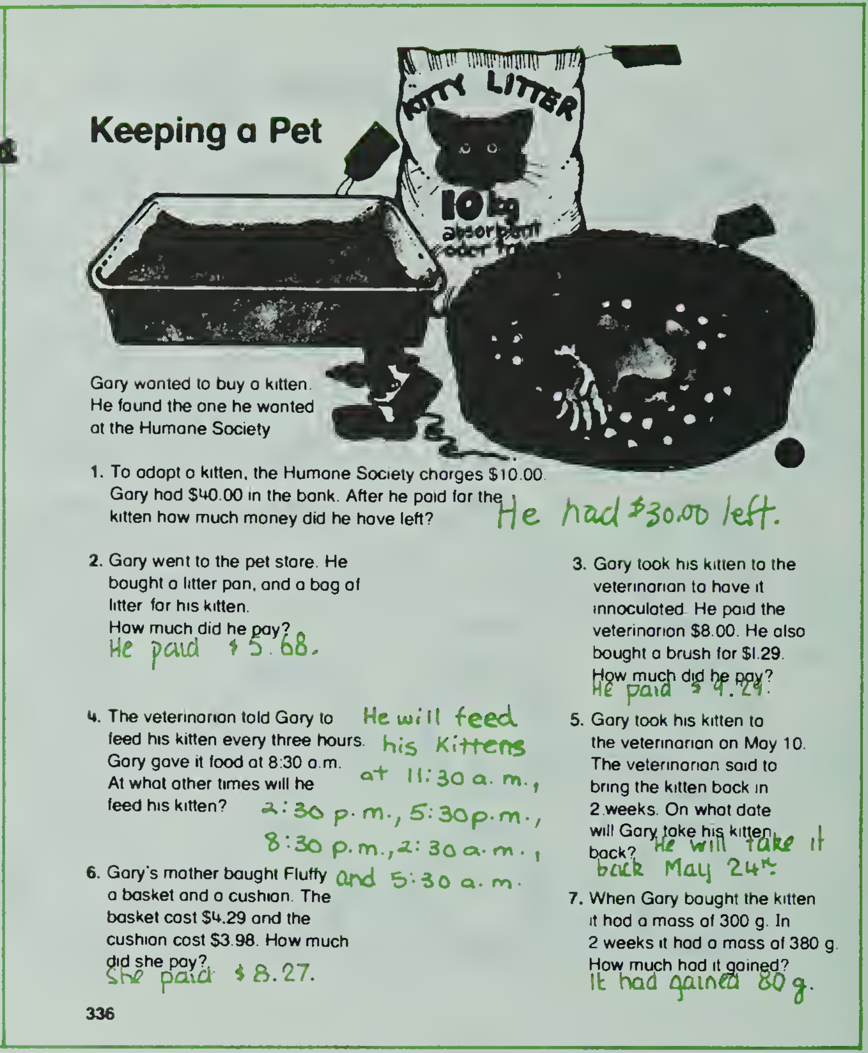

Keeping a Pet

Gary wanted to buy a kitten.
He found the one he wanted
at the Humane Society

1. To adopt a kitten, the Humane Society charges $10.00. Gary had $40.00 in the bank. After he paid for the kitten how much money did he have left? He had $30.00 left.

2. Gary went to the pet store. He bought a litter pan, and a bag of litter for his kitten. How much did he pay?
He paid $5.68.

3. Gary took his kitten to the veterinarian to have it innoculated. He paid the veterinarian $8.00. He also bought a brush for $1.29. How much did he pay?
He paid $9.29.

4. The veterinarian told Gary to feed his kitten every three hours. Gary gave it food at 8:30 a.m. At what other times will he feed his kitten?
He will feed his kittens at 11:30 a.m., 2:30 p.m., 5:30 p.m., 8:30 p.m., 2:30 a.m., and 5:30 a.m.

5. Gary took his kitten to the veterinarian on May 10. The veterinarian said to bring the kitten back in 2 weeks. On what date will Gary take his kitten back?
He will take it back May 24th.

6. Gary's mother bought Fluffy a basket and a cushion. The basket cost $4.29 and the cushion cost $3.98. How much did she pay?
She paid $8.27.

7. When Gary bought the kitten it had a mass of 300 g. In 2 weeks it had a mass of 380 g. How much had it gained?
It had gained 80 g.

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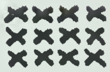
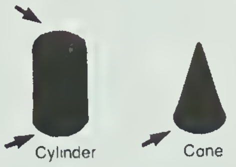
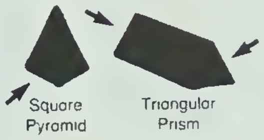
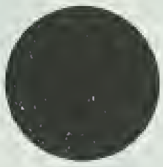
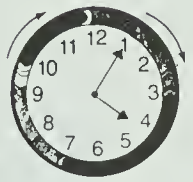
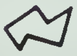
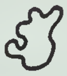
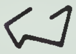
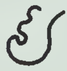
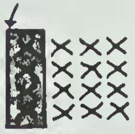
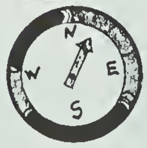
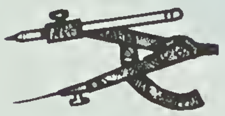
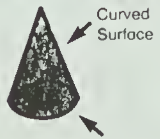
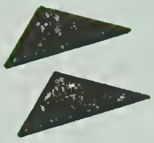
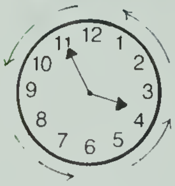
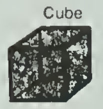
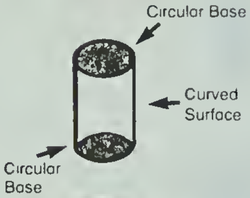
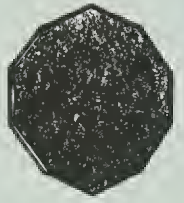
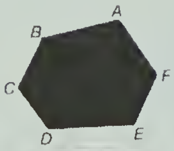
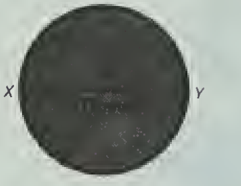
Additional Answers
mathways 3, page 328

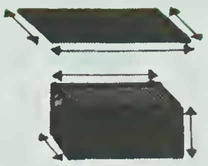
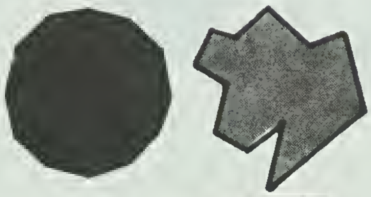
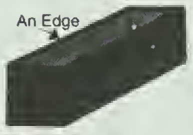
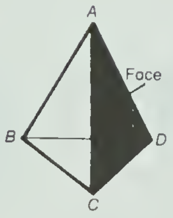
7. 6 hundreds 5 tens and 8
8. 1 hundred 6 tens and 7
9. 3 hundreds 9 tens and 3
10. 3 hundreds 0 tens and 0
11. 5 hundreds 0 tens and 7
12. 2 hundreds 2 tens and 0
13. 5 hundreds 9 tens and 1
14. 4 hundreds 0 tens and 6
15. 2 hundreds 8 tens and 5
16. 8 hundreds 5 tens and 0

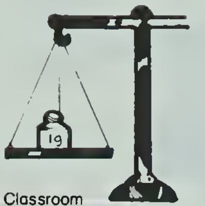
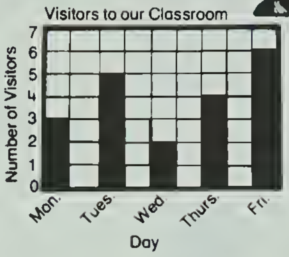
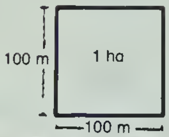
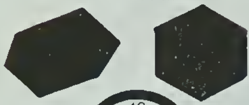
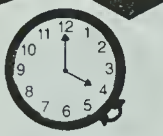
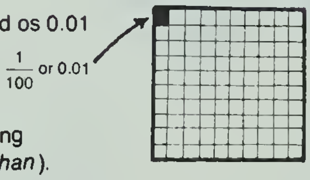
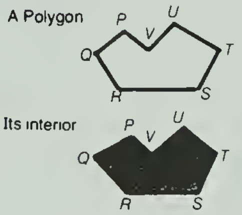
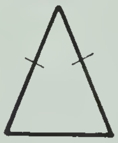
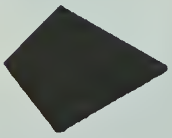
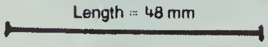
Program Masters

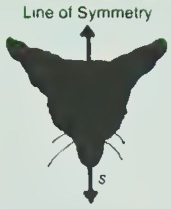
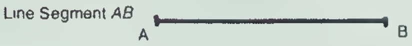
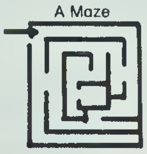
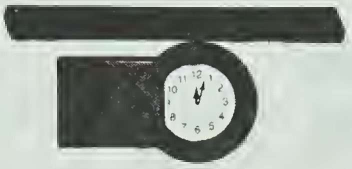
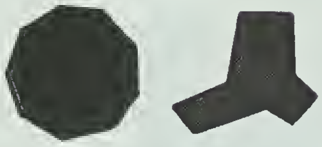
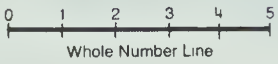
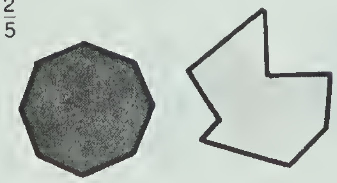
Mathematics Dictionary

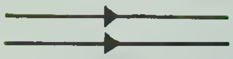
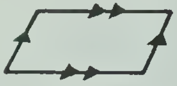
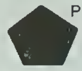
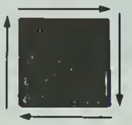
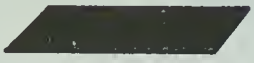
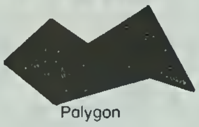
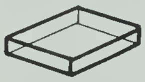
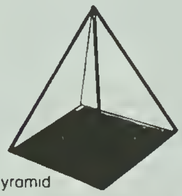
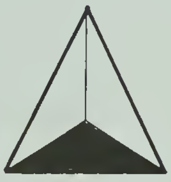
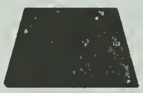
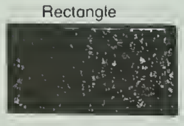
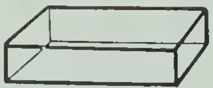
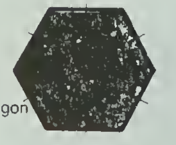
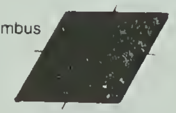
addends	Numbers which are to be added.	$\underbrace{2 + 6 + 11}_{\text{Addends}} = \underbrace{19}_{\text{Sum}}$
addition	An operation which combines 2 addends.	
approximately equal	About. 2.1 × 9 is approximately equal to 2 × 10 or 20	
area	An amount of surface.	
array	A rectangular arrangement in rows and columns.	 An Array
base (of a solid)	The faces indicated are bases of the illustrated solids.	
base (of a triangle)	Any side of a triangle.	
centimetre (cm)	A unit of length equal to one hundredth of a metre. $1 \text{ cm} = \frac{1}{100} \text{ m}$ $= 0.01 \text{ m}$	1 cm
circle	The set of points in a plane at a fixed distance (radius *r*) from a given point (centre, *C*).	 Circle
circumference	The perimeter of (distance around) a circle.	
clockwise	The direction of rotation of the hands of a clock.	
closed figure (curve)	 and  are closed figures.  and  are not closed figures.	
column	Items arranged in a vertical line.	
compass	An instrument used to indicate the direction of the North magnetic pole.	
compasses (pair of)	An instrument used in drawing a circle.	
cone	A 3-dimensional figure with 1 circular base and 1 curved surface.	

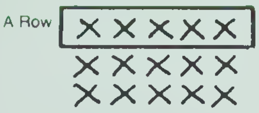
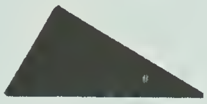
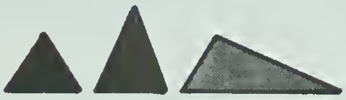
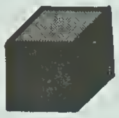
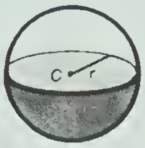
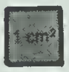
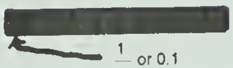
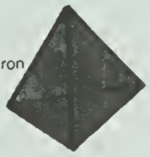
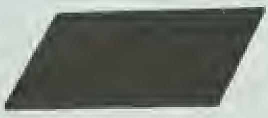
congruent polygons	Polygons of the same size and shape.	
counter-clockwise	The direction of rotation opposite to the direction of rotation of the hands of a clock.	
counting	Matching objects in a set with a subset of the natural numbers 1, 2, 3, 4, ...	
cube	A regular solid with 6 faces. Each face is a square.	
cylinder	A 3-dimensional figure with 2 circular bases and a curved surface.	
day (d)	A unit of time. 1 d = 24 h	
decagon	A polygon with 10 sides.	
decimal	A numeral in decimal notation. 0.5 is a decimal.	
decimal numeration system	A place-value system based on powers of 10 (base 10) which represents numbers by using the 10 symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 as digits.	
decimal place	The power of 10 associated with each position in a decimal numeral. In **172.03** 1 is in the hundreds place 7 is in the tens place 2 is in the units (ones) place 0 is in the tenths place 3 is in the hundredths place.	
decimal point	The dot in a decimal numeral between the units and tenths places.	
denominator	10 is the denominator of the fraction $\frac{3}{10}$.	
diagonal (of a polygon)	A line segment whose end points are 2 vertices which are not consecutive. *AE* is a diagonal of polygon *ABCDEF*.	
diameter	A line segment that passes through the centre of the circle and has its endpoints on the circle.	
difference	The result of subtracting one number from another. 28 is the difference between 84 and 56.	84 56 28

digits	The individual symbols used in a numeration system. The digits are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 for our base 10 system.
dimensions	The length and width of a plane (2-dimensional) figure. The length, width and height of a solid (3-dimensional) figure. 
dividend	3 ←Quotient Divisor→ $6\overline{)23}$ ←*Dividend*→23 = 6 × 3 + 5 18 5 ←Remainder
division	The undoing operation with respect to multiplication. *Multiplication* (doing) 3 × 2 = 6 *Division* (undoing) 6 ÷ 2 = 3
divisor	See *dividend*.
dodecagon	A polygon with 12 sides. 
edge (of a solid)	The line segments formed where 2 faces of the solid meet. The rectangular prism has 12 edges. 
element (of a set)	A member of a set.
equals (=)	Has the same value as. 4 equals 1 + 1 + 2 (that is, 4 = 1 + 1 + 2).
equilateral triangle	A triangle with all sides of equal length.
estimate	A calculation usually made by rounding off numbers to a multiple of a power of 10. 9 × 31 is about 10 × 30 or 300.
even number	An even number has 2 as a factor. {0, 2, 4, 6, . . . } is the set of even whole numbers.
expanded notation	$3124 = \underbrace{3(1000) + 1(100) + 2(10) + 4}_{\text{Expanded Notation}}$
expression	2 or more numbers (or letter symbols for numbers) joined by operation symbols. 3 + 4 is a number expression.
face of a 3-D figure	Triangular region *ADC* is one face of *ABCD*. 
factor (of a number)	36 = 36 × 1 36, 1 are factors of 36. 36 = 18 × 2 18, 2 are factors of 36. 36 = 12 × 3 12, 3 are factors of 36. 36 = 9 × 4 9, 4 are factors of 36. 36 = 6 × 6 6 is a factor of 36.

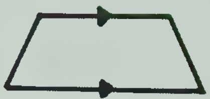
fraction	A numeral in fractional notation. $\frac{3}{4}$ is a fraction.
geometry	A study of figures. 
gram (g)	A unit of mass equal to one thousandth of a kilogram. $1\text{ g} = \frac{1}{1000}\text{ kg}$ $= 0.001\text{ kg}$
graph	An illustration of information. 
greater than (>)	7 *is greater than* 3 (that is, $7 > 3$).
hectare (ha)	A unit of area. $1\text{ ha} = 10\,000\text{ m}^2$  100 m 1 ha 100 m
hexagon	A polygon with 6 sides. 
hour (h)	A unit of time. $1\text{ h} = \frac{1}{24}\text{ d}$ $24\text{ h} = 1\text{ d}$  12 1 2 3 4 5 6 7 8 9 10 11
hundredth	One hundredth can be expressed as 0.01 or $\frac{1}{100}$.  $\frac{1}{100}$ or 0.01
inequality	A mathematical sentence involving $>$ (*is greater than*) or $<$ (*is less than*).
interior (of a plane figure)	The points inside the figure.  A Polygon P V U Q T R S Its interior P V U Q T R S
isosceles triangle	A triangle with 2 sides of equal length. 
kilogram (kg)	A unit of mass. $1\text{ kg} = 1000\text{ g}$
kilolitre (kL)	A unit of capacity. $1\text{ kL} = 1000\text{ L}$
kilometre (km)	A unit of length. $1\text{ km} = 1000\text{ m}$
kite	A quadrilateral with one diagonal bisected by the other. 
length	A measurement that describes a line segment.  Length = 48 mm
less than	3 *is less than* 7 (that is, $3 < 7$).
litre (L)	A unit of capacity. $1\text{ L} = 1000\text{ mL}$

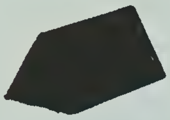
line of symmetry	If the figure is folded along the line *s*, the 2 parts of the figure coincide. The figure is symmetrical with respect to the line. 
line segment	
mass	The amount of matter an object contains.
mathematics	The logical study of number, pattern, shape, and related concepts.
maze	A network of paths. 
metre (m)	The basic unit of length in the metric system of measurement. 
minute (min)	A unit of time. $1\text{ min} = \frac{1}{60}\text{ h}$ $60\text{ min} = 1\text{ h}$
millilitre (mL)	A unit of capacity equal to one thousandth of a litre. $1\text{ mL} = \frac{1}{1000}\text{ L}$ $= 0.001\text{ L}$
millimetre (mm)	A unit of length equal to one thousandth of a metre. $1\text{ mm} = \frac{1}{1000}\text{ m}$ $= 0.001\text{ m}$
multiplication	An operation which combines 2 factors.
n-gon	A polygon with *n* sides.
nonagon	A polygon with 9 sides. 
number line	An illustration of a set of numbers. 
number pair	Any pair of numbers.
numeral	A symbol which represents a number.
numerator	2 is the numerator of the fraction $\frac{2}{5}$
octagon	A polygon with 8 sides. 
odd number	An odd number does not have 2 as a factor. {1, 3, 5, 7, . . . } is the set of odd whole numbers.
ordered pair	A pair of numbers in a specific order. The ordered pair (1, 2) has the opposite order to (2, 1).

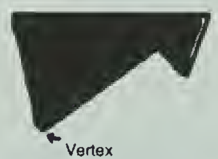
parallel lines	Lines in the same plane with no points in common.	 Parallel Lines
parallelagram	A quadrilateral with both pairs of opposite sides parallel.	 Parallelogram
pentagan	A polygon with 5 sides.	
perimeter	The distance around a figure.	
place value	The value of a digit as a result of its place in a number. In 235, the place value of 2 is 2 × 100 or 200. In 325, the place value of 2 is 2 × 10 or 20.	
plane	A flat surface.	
plane figure	A 2-dimensional figure in a plane.	
palygon	A closed plane figure in which each side is a line segment.	
prism	A 3-dimensional figure in which: the 2 bases are congruent polygons, and the other faces are parallelograms.	 Rectangular Prism
product	The result of multiplication.	
pyramid	A 3-dimensional figure in which: 1 face is a polygon and all other faces are triangles.	 Square Pyramid  Triangular Pyramid
quadrilateral	A polygon with 4 sides.	 Quadrilateral
quotient	4 is called the quotient of 12 ÷ 3. See *dividend*.	$12 \div 3 = 4$
radius	See *circle*.	
rectangle	A parallelogram with angles which are right angles.	
rectangular solid	A rectangular prism. See *prism*.	 Rectangular Solid
regular polygon	A polygon with all sides equal and all angles equal.	 Regular Hexagon
remainder	See *dividend*.	
rhombus	A parallelogram with all sides of equal length.	

row	Items arranged in a horizontal line.	
scalene triangle	A triangle with no 2 sides equal.	
set	A collection of things.	
solid	A 3-dimensional figure.	
sphere	The set of all points in space at a fixed distance (radius, *r* units) from a given point (centre, *C*).	
square	A rhombus with interior angles right angles.	
square centimetre (cm^2)	A unit of area.	
subtraction	The inverse (undoing) operation with respect to addition. *Addition* (doing) $3 + 5 = 8$ *Subtraction* (undoing) $8 - 5 = 3$	
sum	The result of adding.	
tangram	An ancient puzzle.	
temperature	A measurement of heat.	
tenth	One tenth can be expressed as 0.1 or $\frac{1}{10}$.	
tetrahedron	A triangular pyramid.	
tesselation	An arrangement of geometric figures that would cover (tile) a plane.	 Tessellation of Parallelograms

thermometer	An instrument to measure temperature.
tiling	See *tesselation.*
trapezoid	A quadrilateral with 1 pair of opposite sides parallel.
triangle	A polygon with 3 sides.
triangular prism	A 3-dimensional figure in which: 2 bases are triangles and the other faces are parallelograms.
vertex (of a polygon)	The point of intersection of adjacent sides of a polygon. (Plural: vertices)
volume	An amount of space.
year (a)	A unit of time. 1 a = 365 d


Trapezoid





Program Masters

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Program Master 1
Letter to Parents

Dear Parent or Guardian,

This year we are using mathways 3 second edition in our mathematics classes. Periodically throughout the year I will be sending short, informal notes to you.

It is important that children love mathematics and have confidence in their ability to do it. These letters will offer ways for you to encourage and support your child.

Mathematics in schools has changed a great deal over the last few years. Children used to have to be content to learn basic arithmetic skills. Today we still expect grade 3 children to develop those same skills, but we want them to learn much more — geometry, measurement, graphing and problem solving have been added. Mathematics has become fun. For example we pour water to learn the capacity of a container, play games to learn addition facts, and try to find triangles at work in our community.

Most importantly we want children to see the relationship between mathematics and the real world. You can help:

- by talking about how important mathematics is,
- by pointing out how you use math at work and at home,
- by inquiring what was learned in math today.

Please don't tell your child that you couldn't do math when you were in school.

Come and visit at math time — or any time.

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Program Master 2
1 cm Dot Paper

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Program Master 3
2 cm Dot Paper

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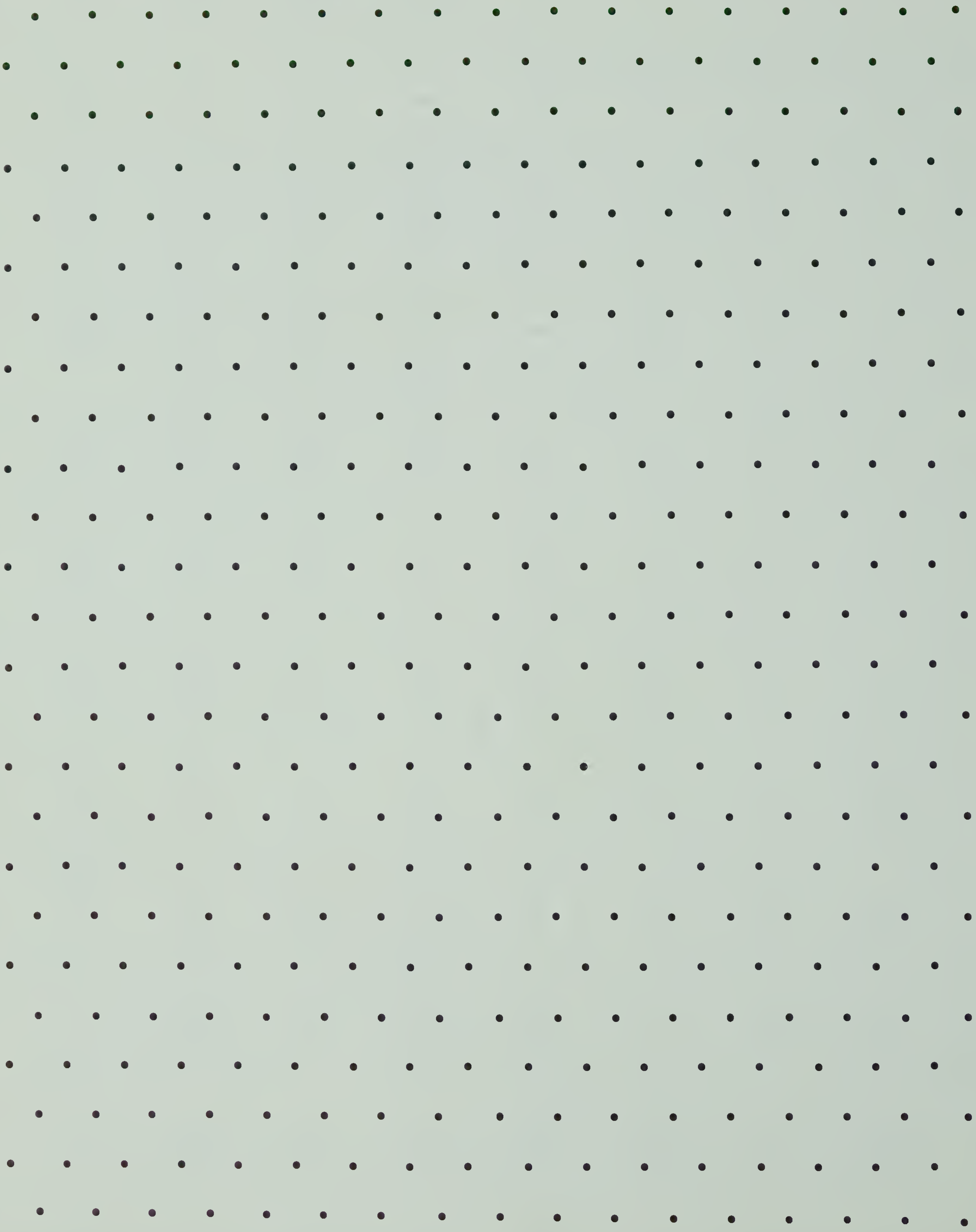
Program Master 4
Isometric Dot Paper



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Program Master 5
1 cm Graph Paper

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Program Master 6
2 cm Graph Paper

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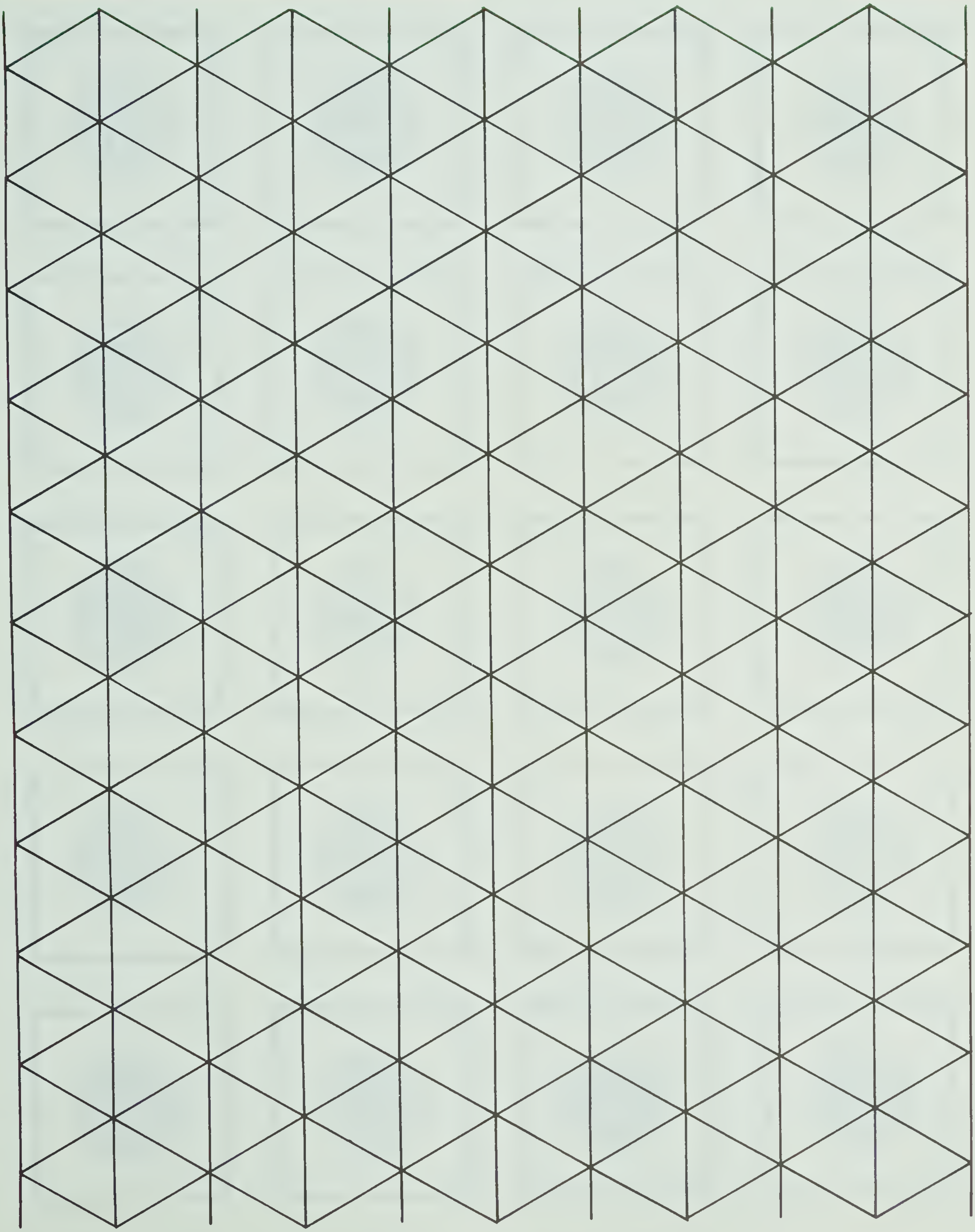
Program Master 7
Isometric Grid Paper



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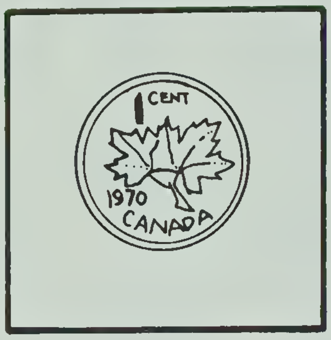
Program Master 8
Money: Pennies (front)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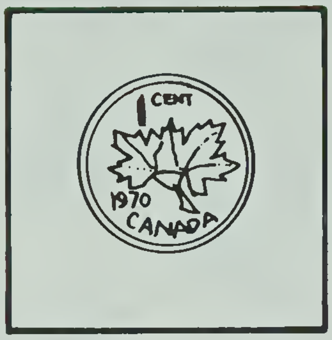
1970
CANADA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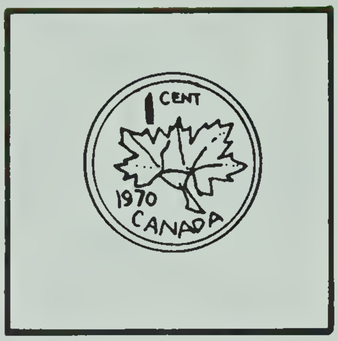
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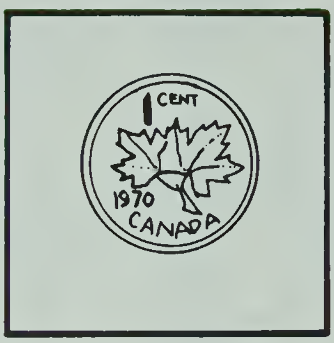
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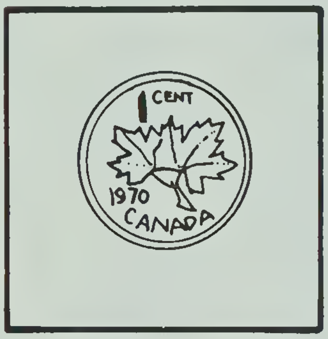
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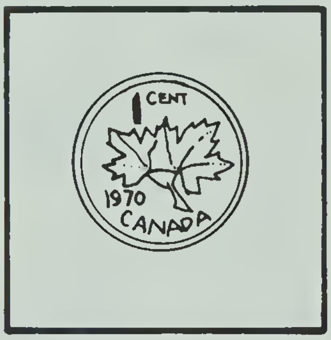
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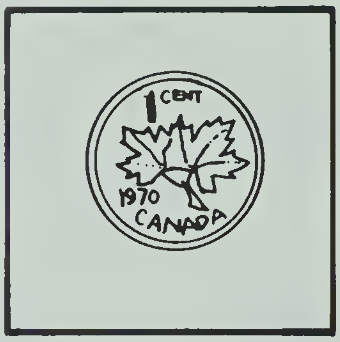
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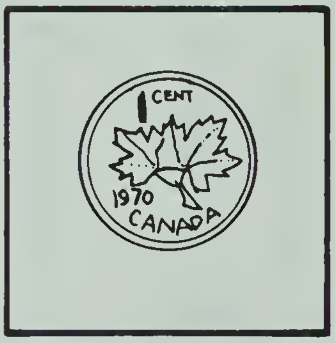
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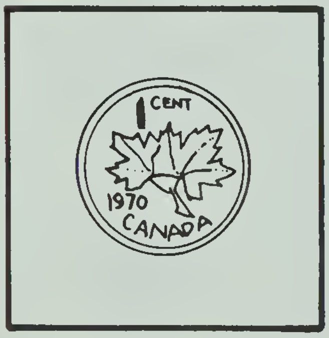
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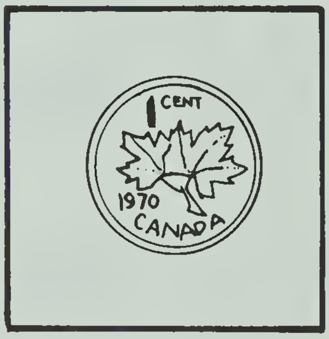
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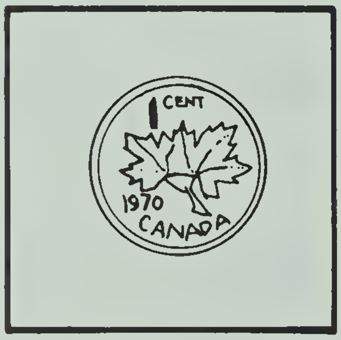
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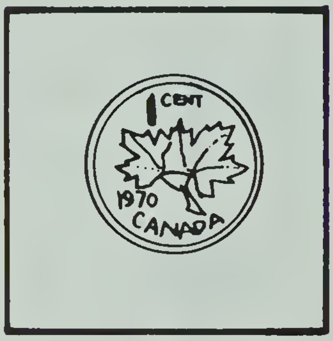
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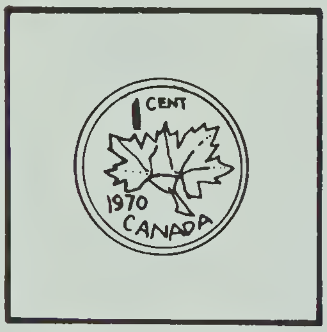
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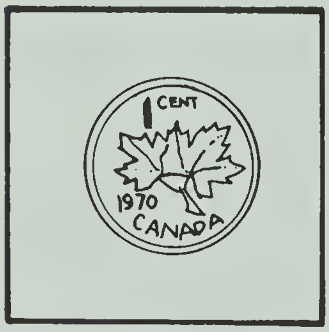
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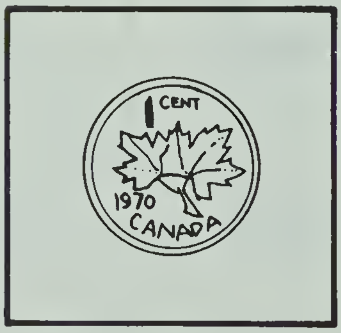
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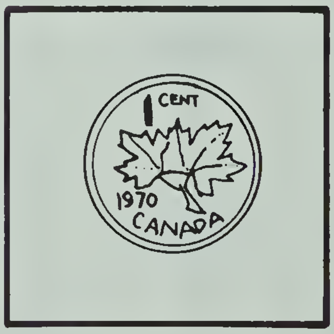
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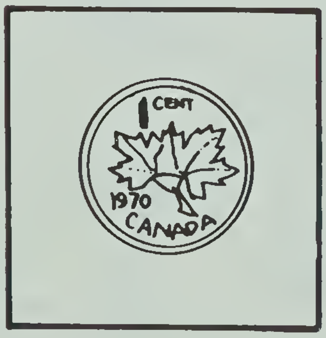
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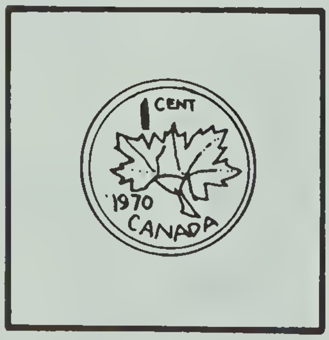
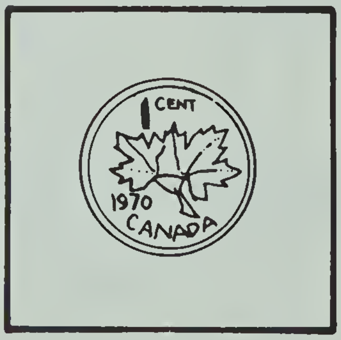
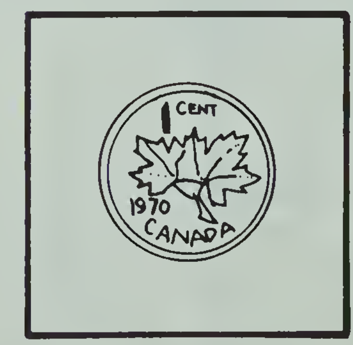
1970
CANADA


1 CENT
1970
CANADA


1 CENT
1970
CANADA


1 CENT
1970
CANADA

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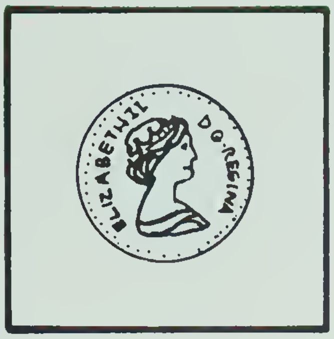
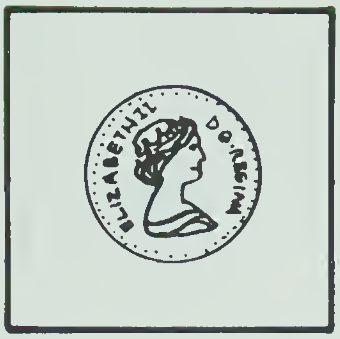
Program Master 9
Money: Pennies (back)


ELIZABETH II
D·G·REGINA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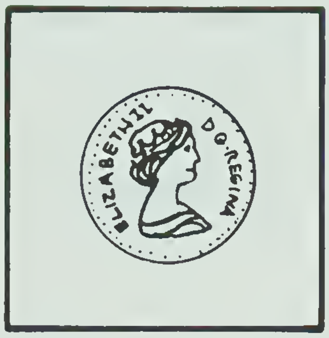
D·G·REGINA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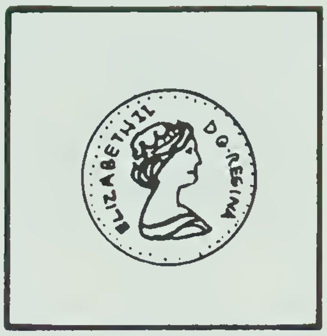
D·G·REGINA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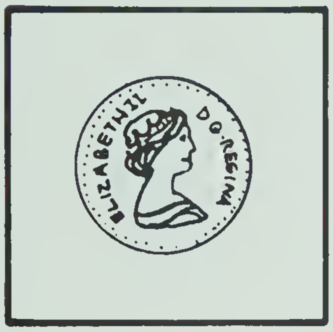
D·G·REGINA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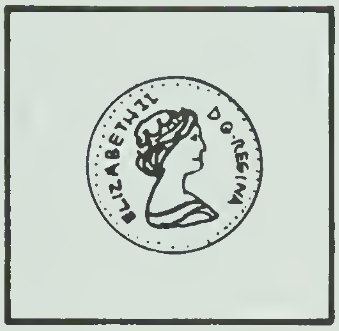
D·G·REGINA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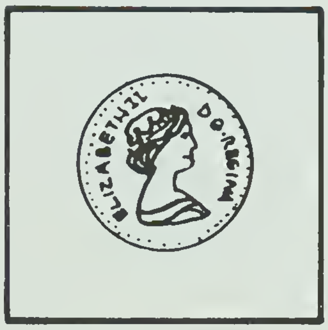
D·G·REGINA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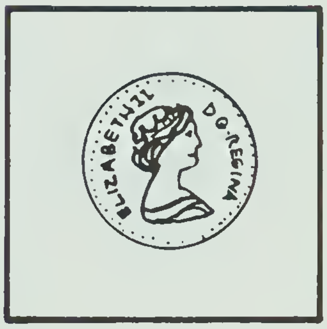
D·G·REGINA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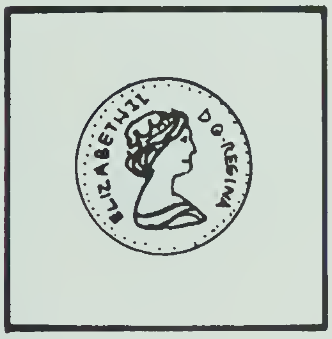
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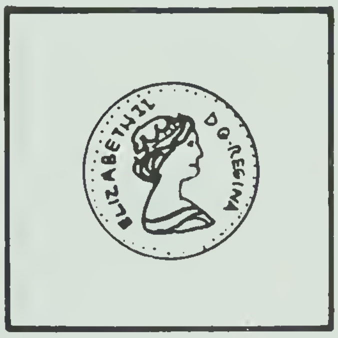
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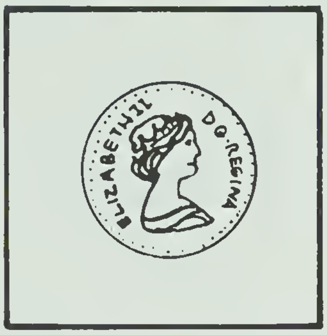
D·G·REGINA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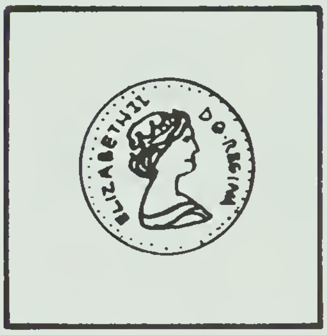
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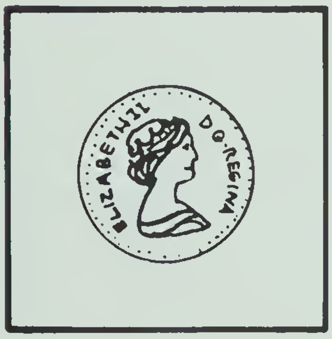
D·G·REGINA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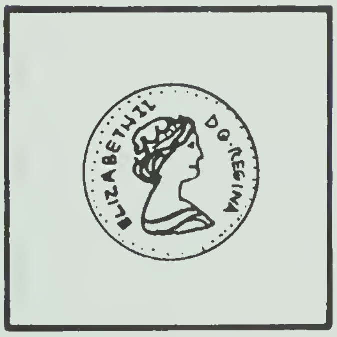
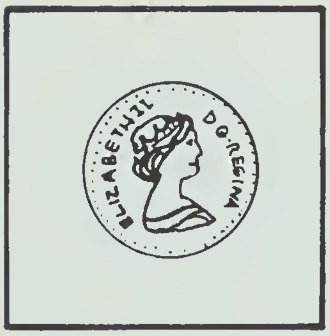
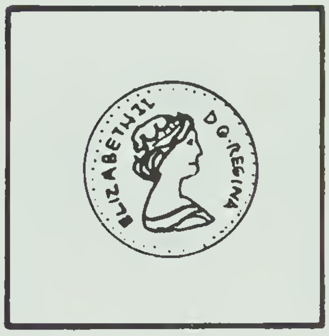
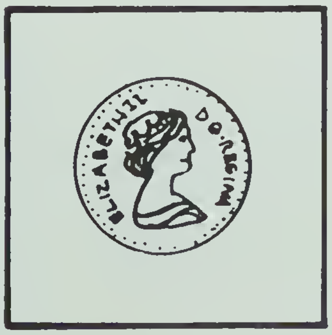
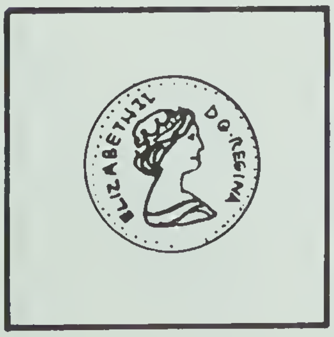
D·G·REGINA

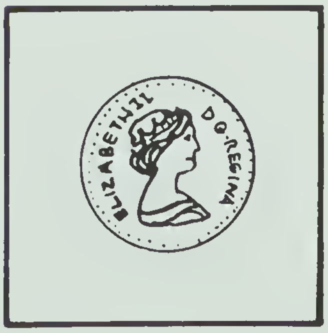

ELIZABETH II
D·G·REGINA

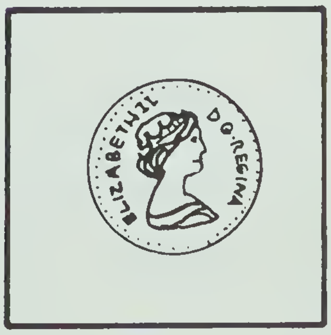

ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA

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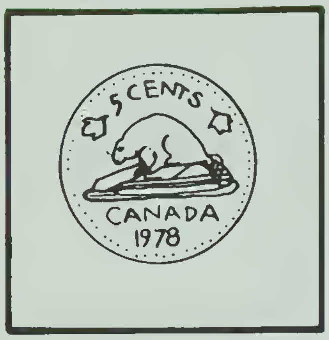
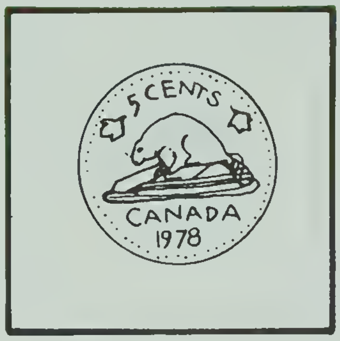
Program Master 10
Money: Nickels, Dimes (front)


5 CENTS
CANADA
1978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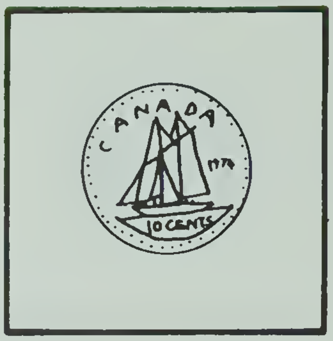
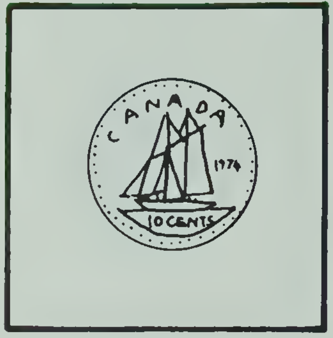
CANADA
1978


CANADA
1974
10 CENTS


CANADA
1974
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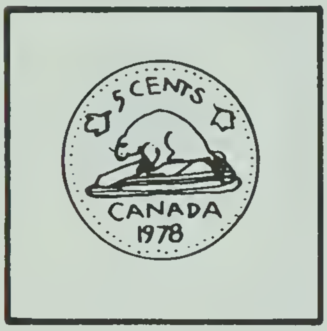
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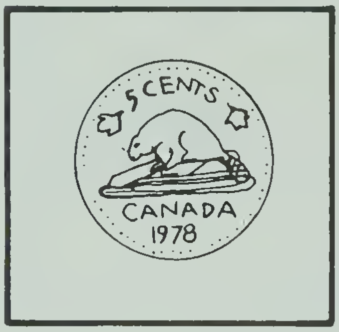
CANADA
1978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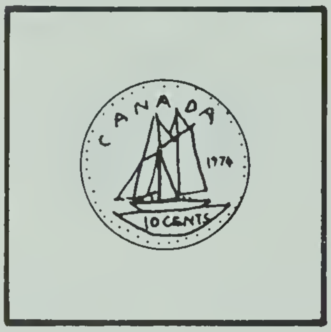
1978


CANADA
1974
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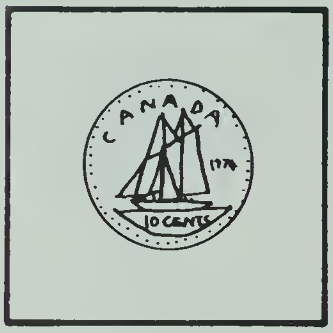
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1974
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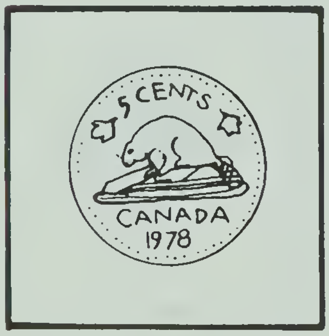
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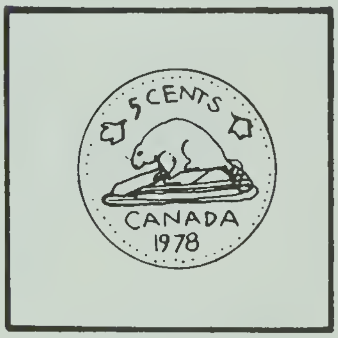
1978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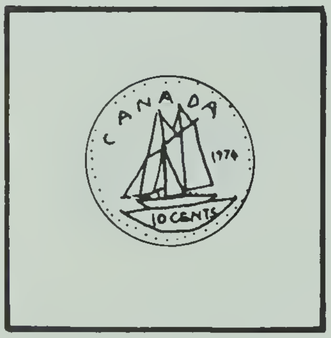
1978


CANADA
1974
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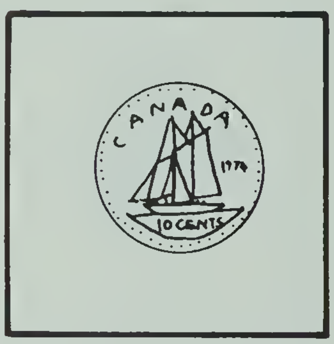
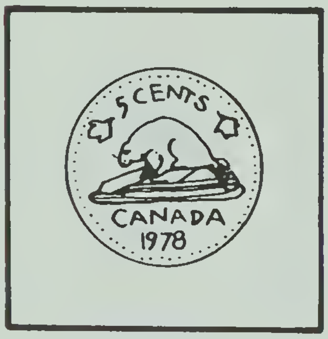

CANADA
1974
10 CENTS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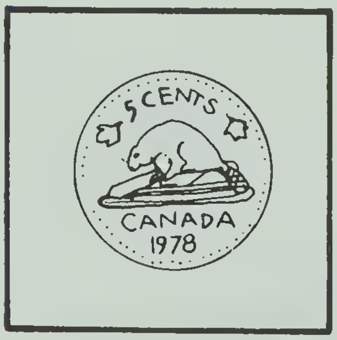
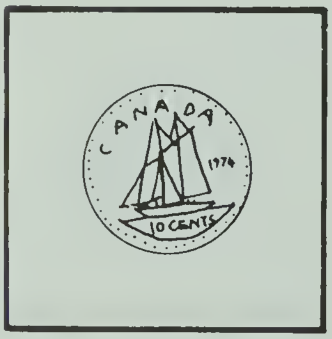
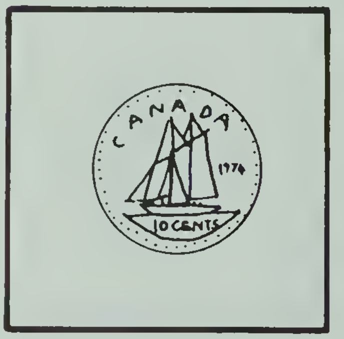
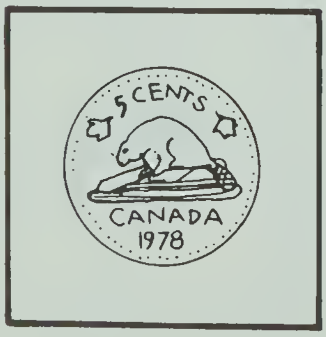
CANADA
1978


5 CENTS
CANADA
1978


CANADA
1974
10 CENTS


CANADA
1974
10 CENTS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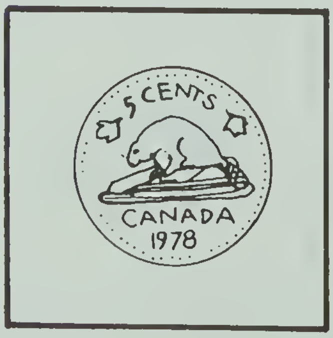
CANADA
1978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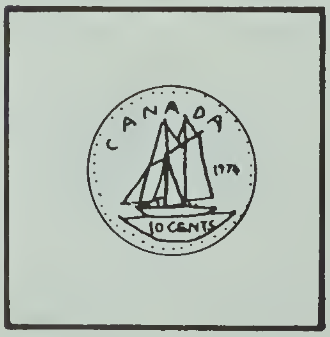
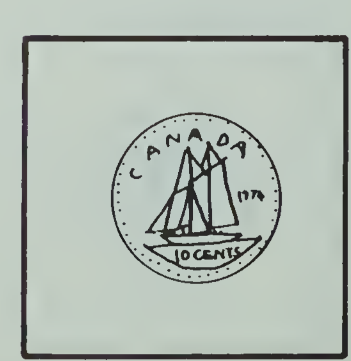
1978


CANADA
1974
10 CENTS


CANADA
1974
10 CENTS

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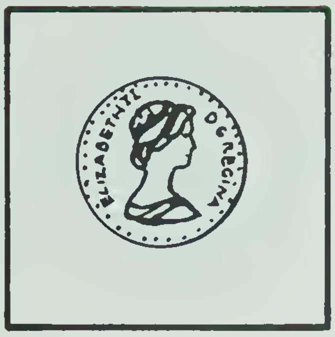
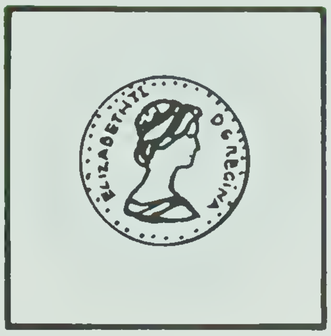
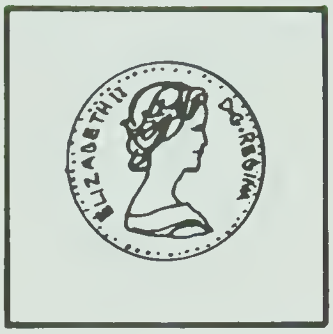
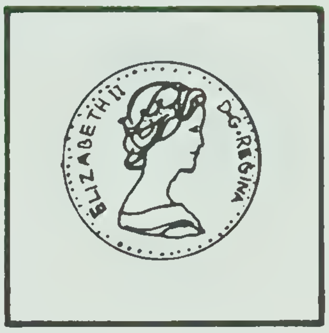
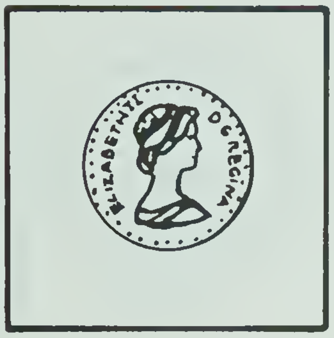
Program Master 11
Money: Nickels, Dimes (back)

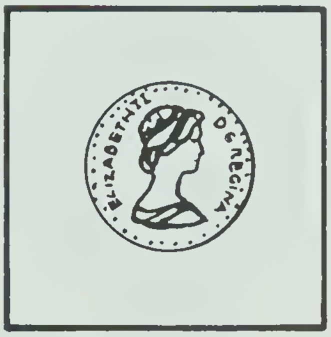

ELIZABETH II
D·G·REGINA

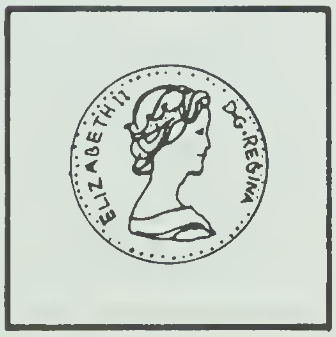

ELIZABETH II
D·G·REGINA

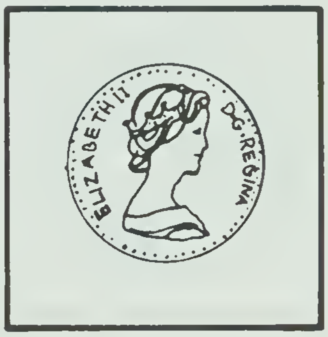

ELIZABETH II
D·G·REGINA

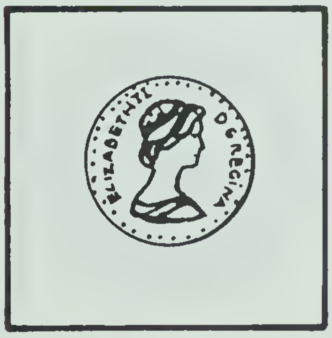

ELIZABETH II
D·G·REGINA

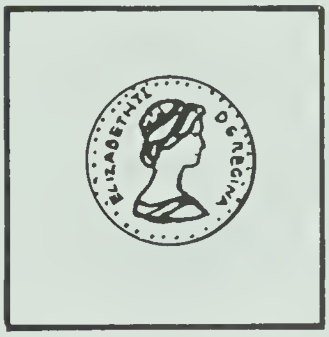

ELIZABETH II
D·G·REGINA

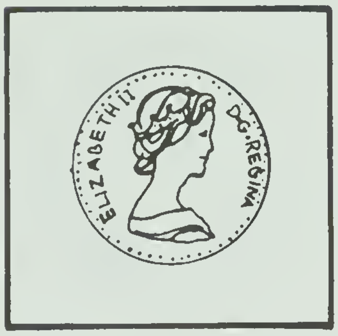

ELIZABETH II
D·G·REGINA

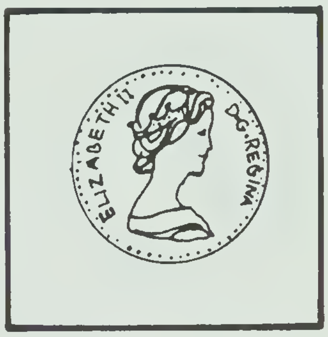

ELIZABETH II
D·G·REGINA

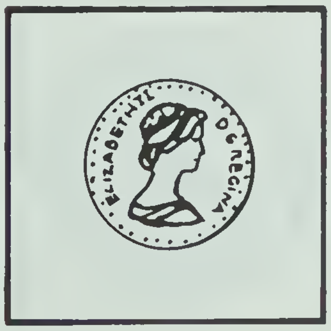

ELIZABETH II
D·G·REGINA

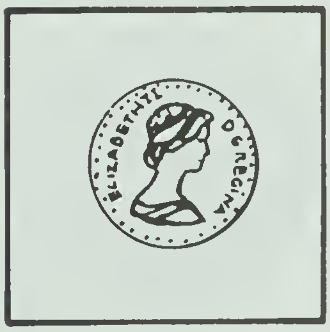

ELIZABETH II
D·G·REGINA

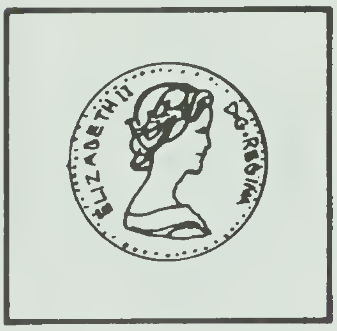

ELIZABETH II
D·G·REGINA

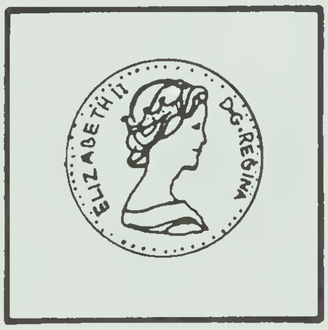

ELIZABETH II
D·G·REGINA

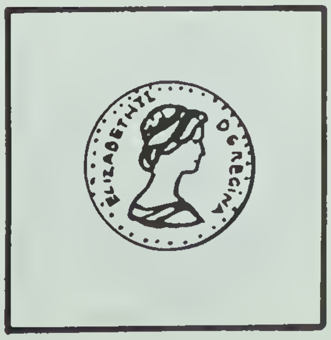

ELIZABETH II
D·G·REGINA

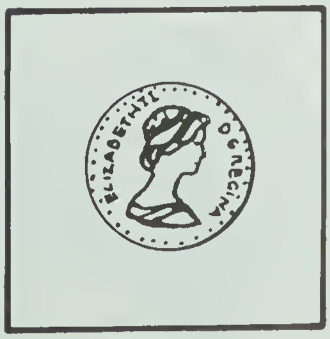

ELIZABETH II
D·G·REGINA

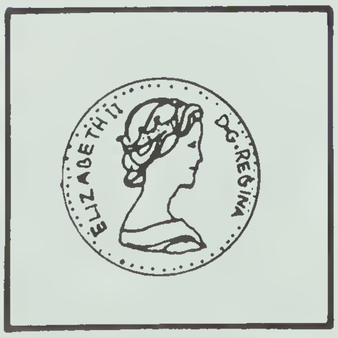

ELIZABETH II
D·G·REGINA

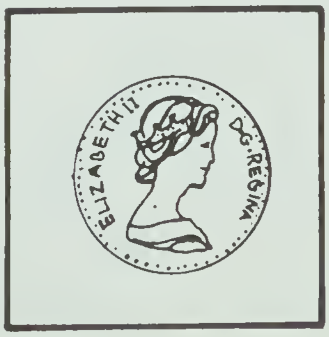

ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA


ELIZABETH II
D·G·REGINA

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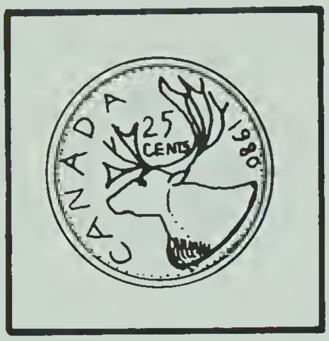
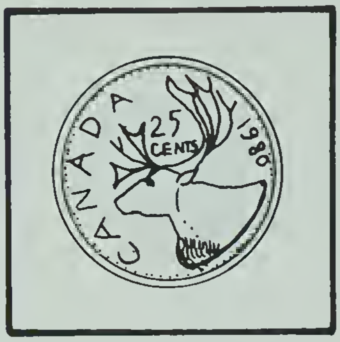
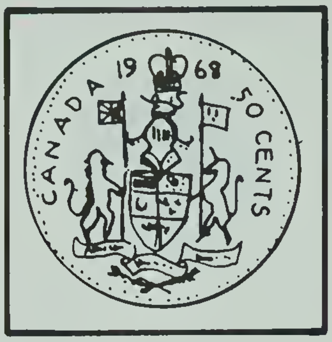
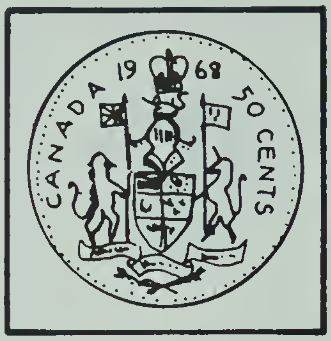
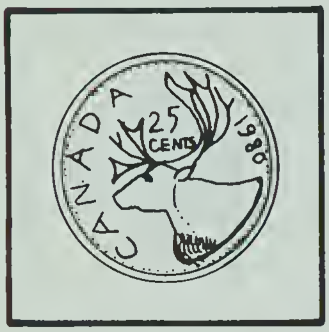
Program Master 12
Money: Quarters, Fifty-Cent Pieces (front)

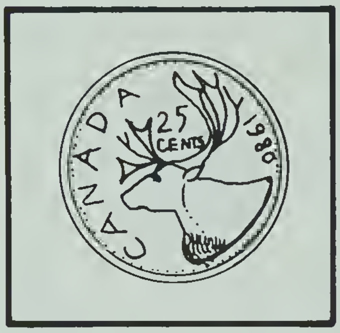

CANADA
25
CENTS
1980

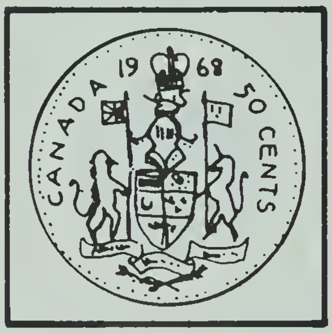

CANADA
25
CENTS
1980

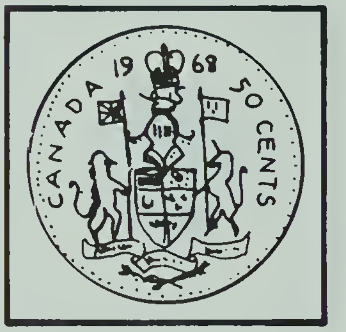

19
68
CANADA
50 CENTS

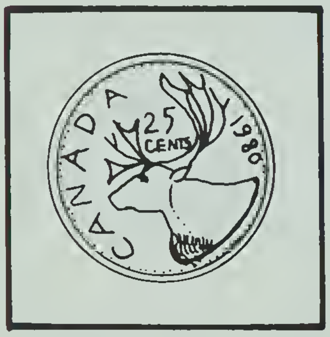

19
68
CANADA
50 CENTS


CANADA
25
CENTS
1980


CANADA
25
CENTS
1980


19
68
CANADA
50 CENTS


19
68
CANADA
50 CENTS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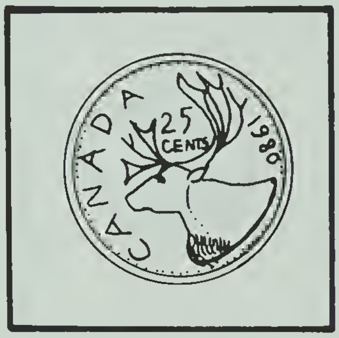
25
CENTS
1980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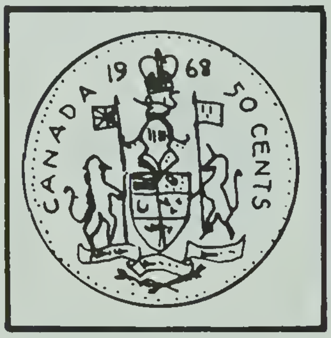
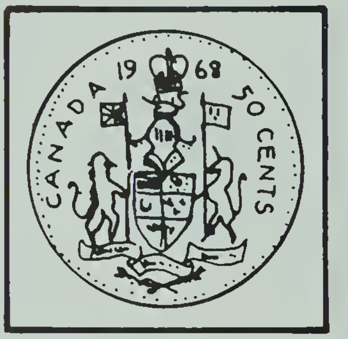
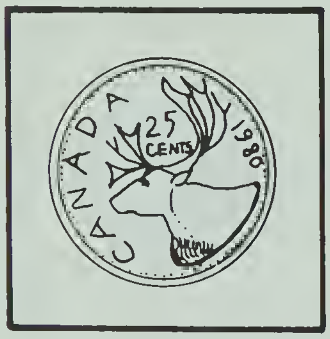
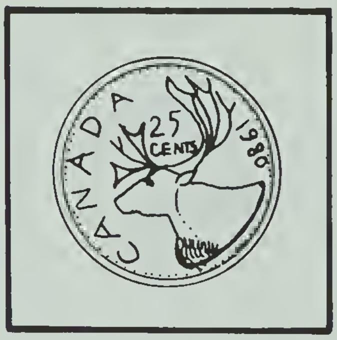
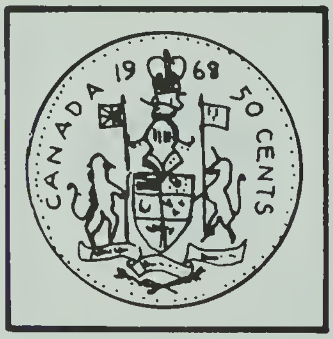
25
CENTS
1980

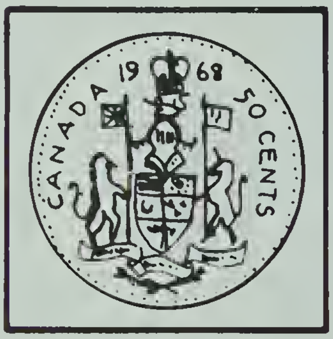

19
68
CANADA
50 CENTS

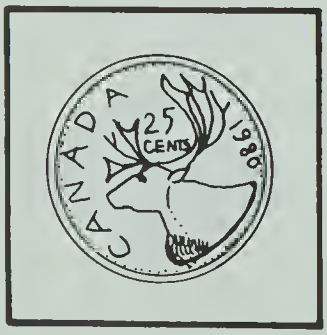

19
68
CANADA
50 CENTS

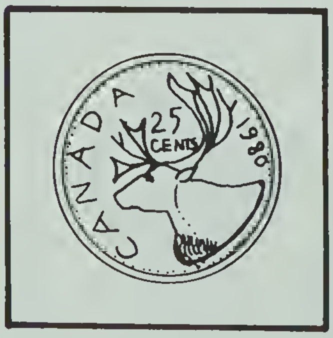

CANADA
25
CENTS
1980

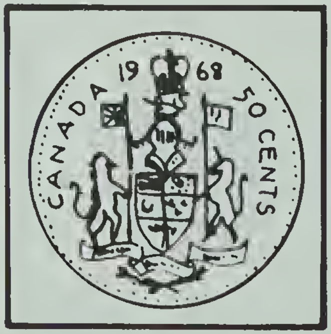

CANADA
25
CENTS
1980

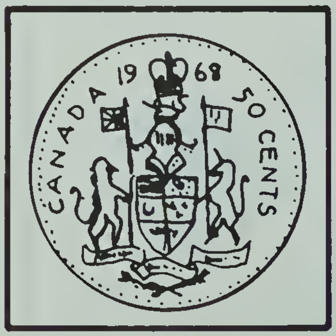

19
68
CANADA
50 CENTS


19
68
CANADA
50 CENTS


CANADA
25
CENTS
1980


CANADA
25
CENTS
1980


19
68
CANADA
50 CENTS


19
68
CANADA
50 CENTS

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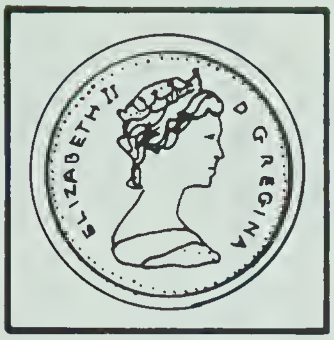
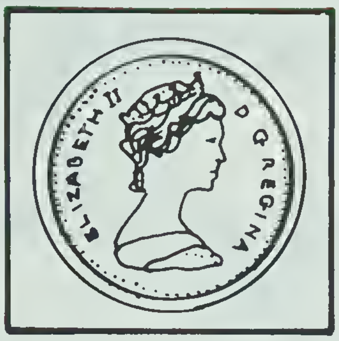
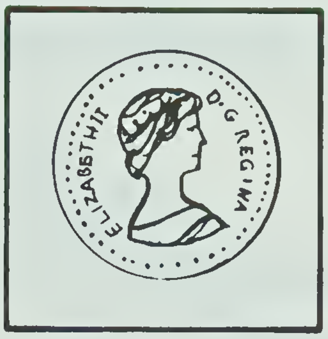
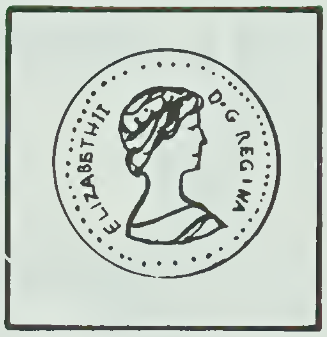
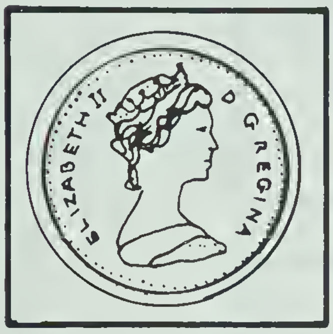
Program Master 13
Money: Quarters, Fifty-Cent Pieces (back)

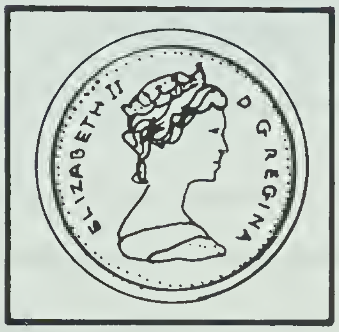

ELIZABETH II
D G REGINA

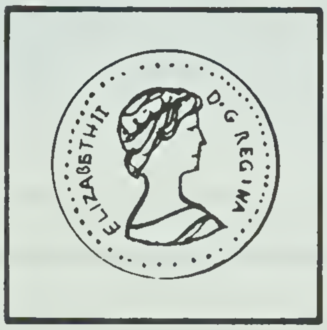

ELIZABETH II
D G REGINA

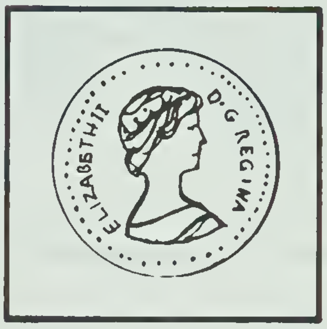

ELIZABETH II
D G REGINA

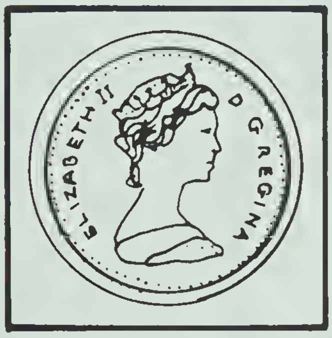

ELIZABETH II
D G REGINA

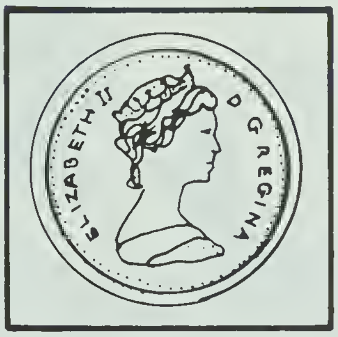

ELIZABETH II
D G REGINA

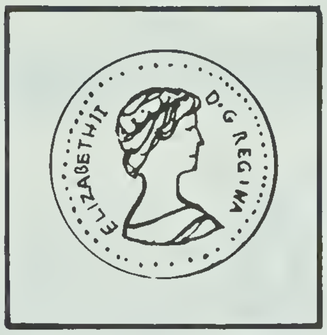

ELIZABETH II
D G REGINA

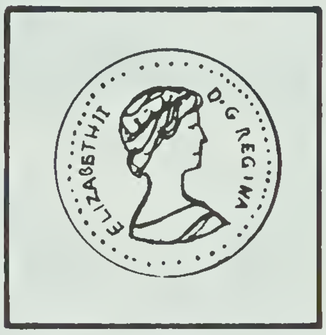

ELIZABETH II
D G REGINA

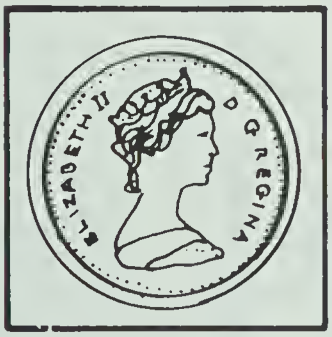

ELIZABETH II
D G REGINA

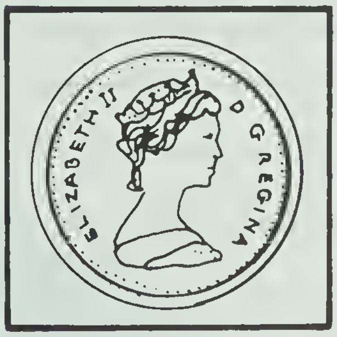

ELIZABETH II
D G REGINA

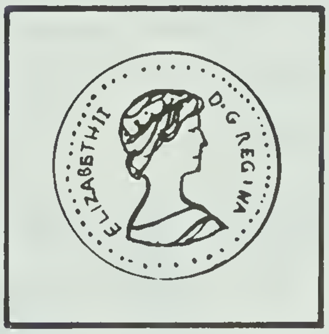

ELIZABETH II
D G REGINA

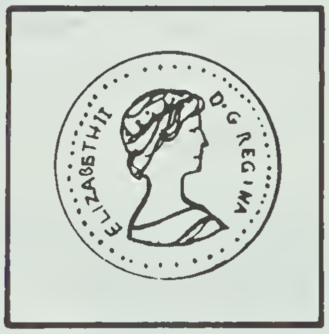

ELIZABETH II
D G REGINA

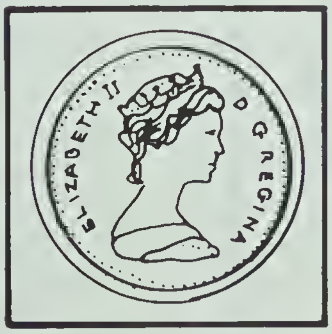

ELIZABETH II
D G REGINA

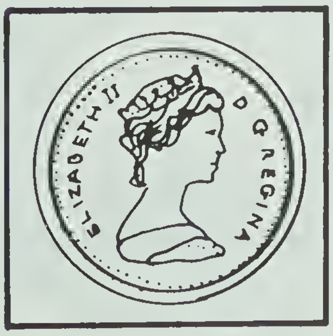

ELIZABETH II
D G REGINA

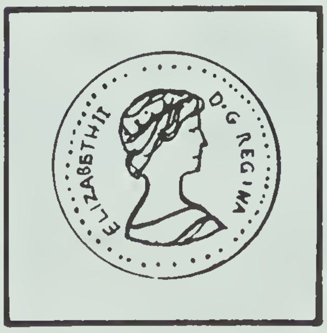

ELIZABETH II
D G REGINA

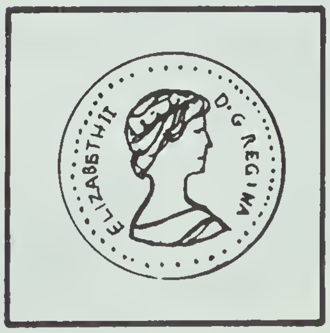

ELIZABETH II
D G REGINA


ELIZABETH II
D G REGINA


ELIZABETH II
D G REGINA


ELIZABETH II
D G REGINA


ELIZABETH II
D G REGINA


ELIZABETH II
D G REGINA

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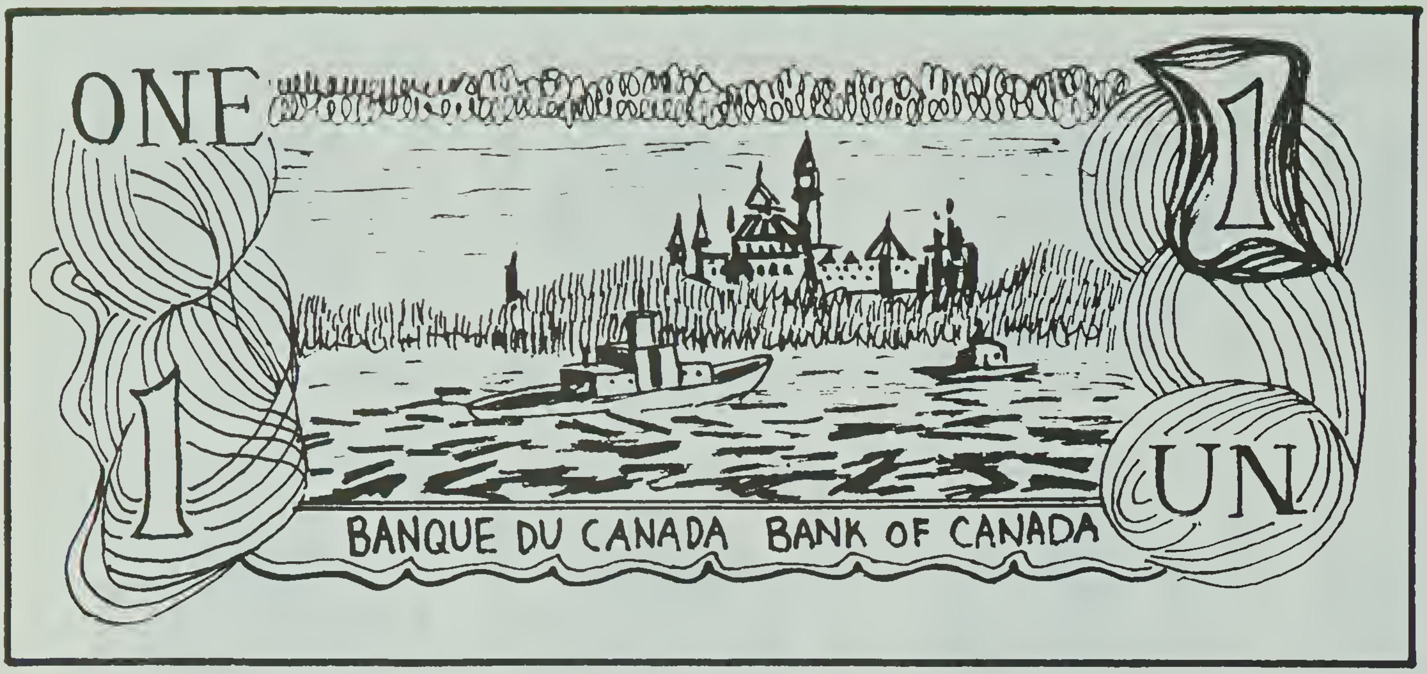
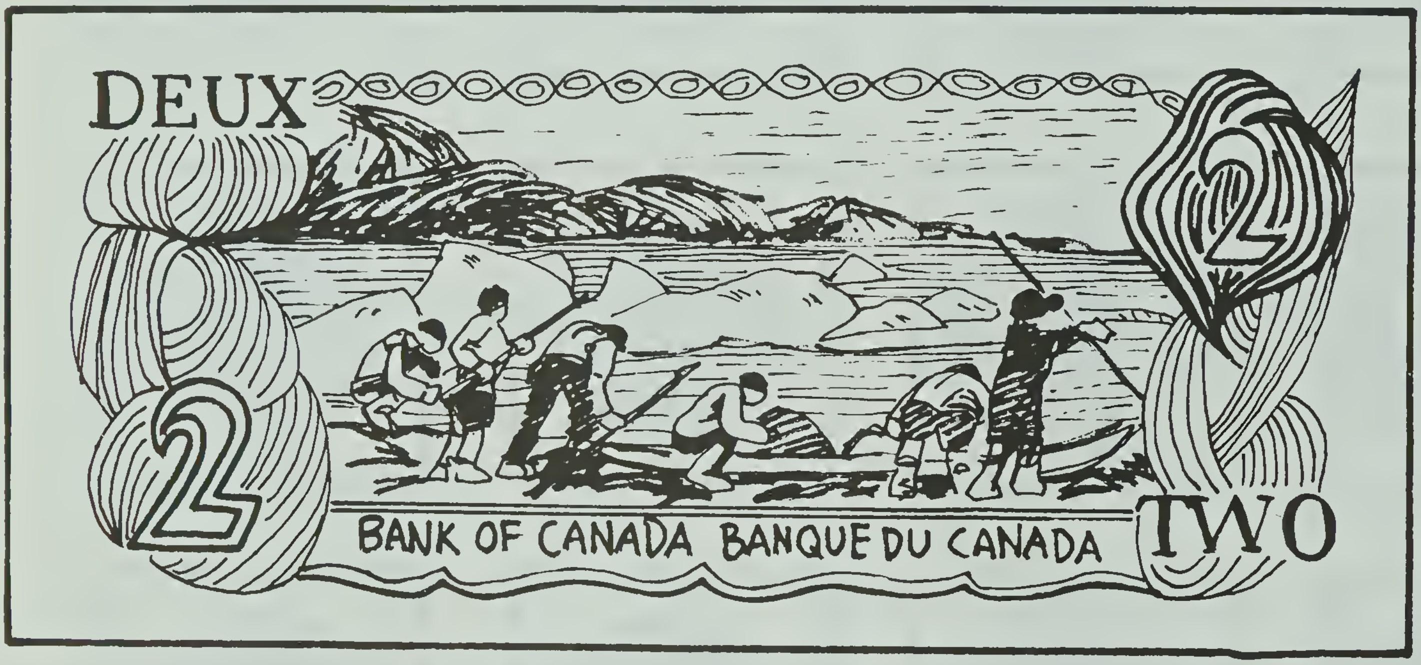
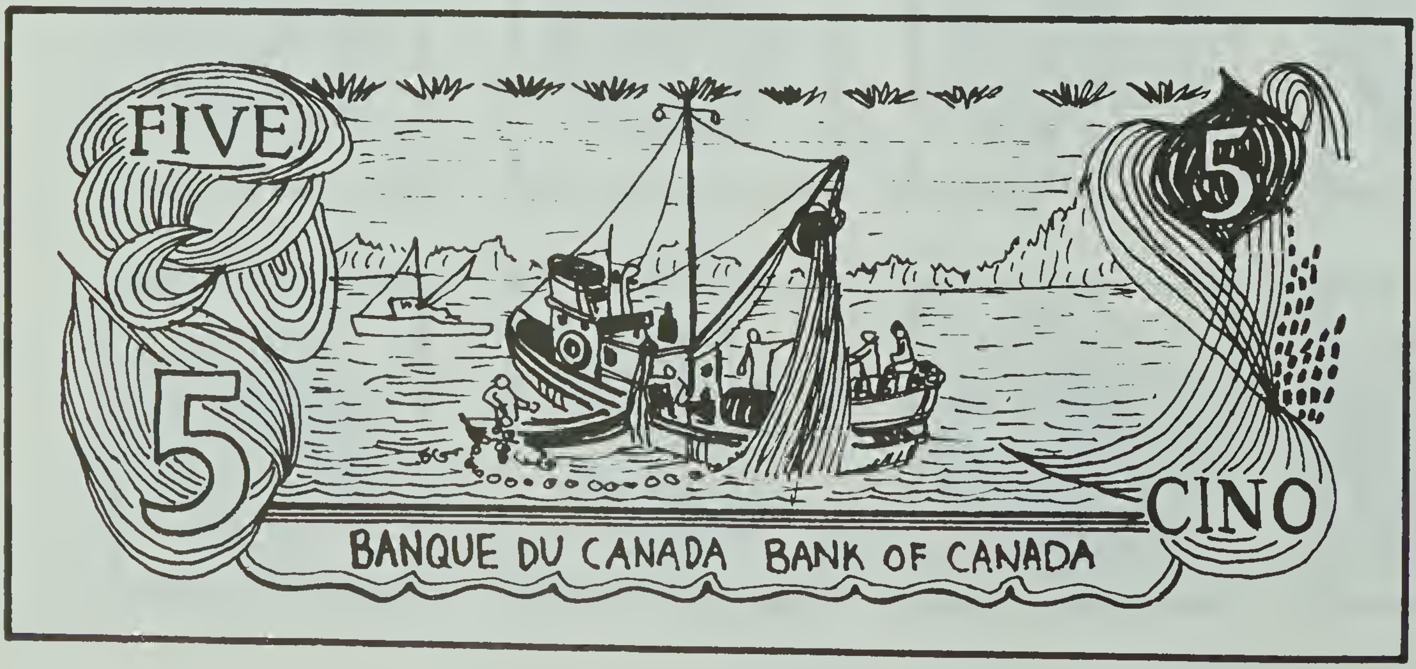
Program Master 14
Money: $1.00, $2.00, $5.00


ONE
1
1
UN
BANQUE DU CANADA BANK OF CANADA


DEUX
2
2
TWO
BANK OF CANADA BANQUE DU CANADA


FIVE
5
5
CINQ
BANQUE DU CANADA BANK OF CANADA

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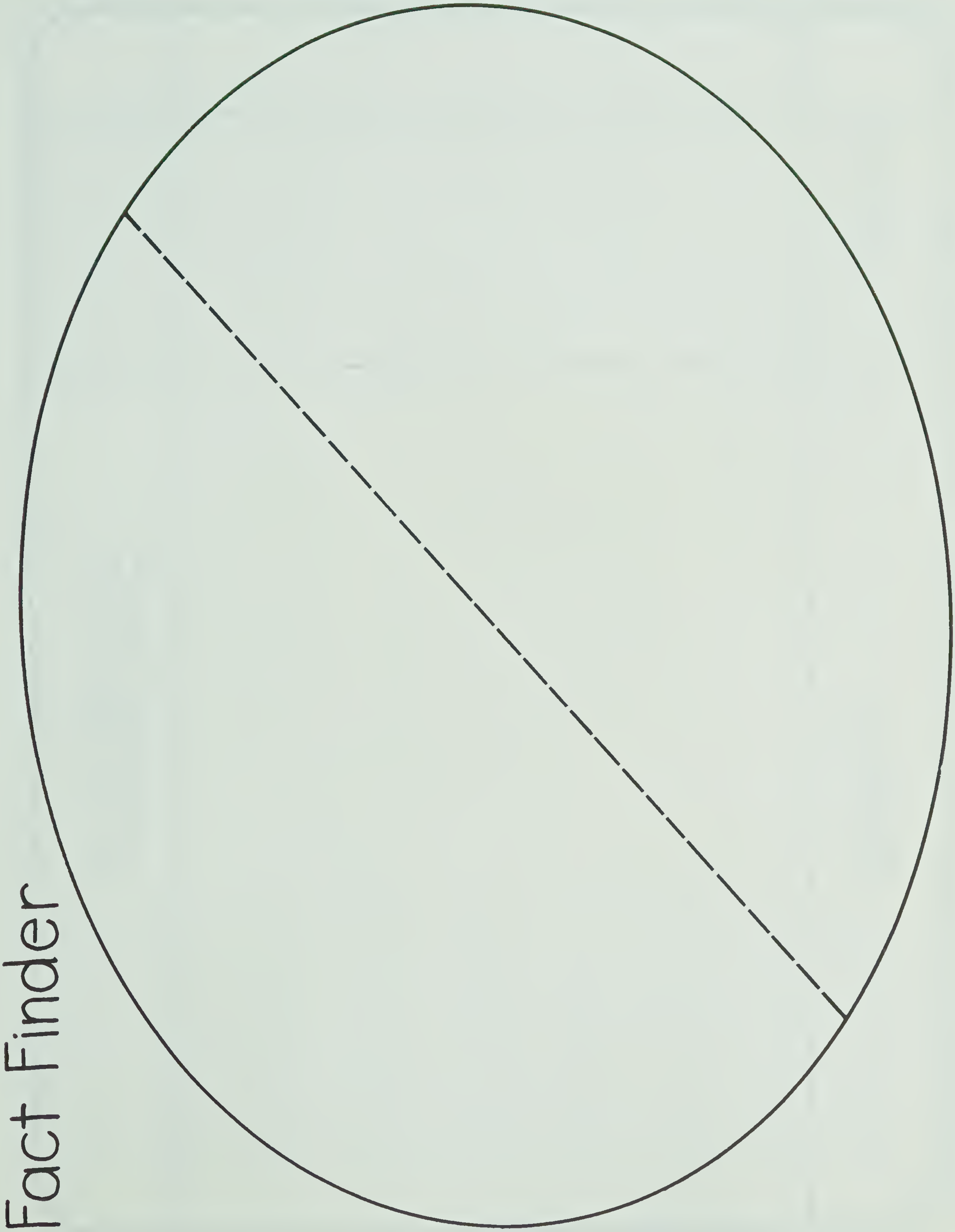
Program Master 15
Fact Finder



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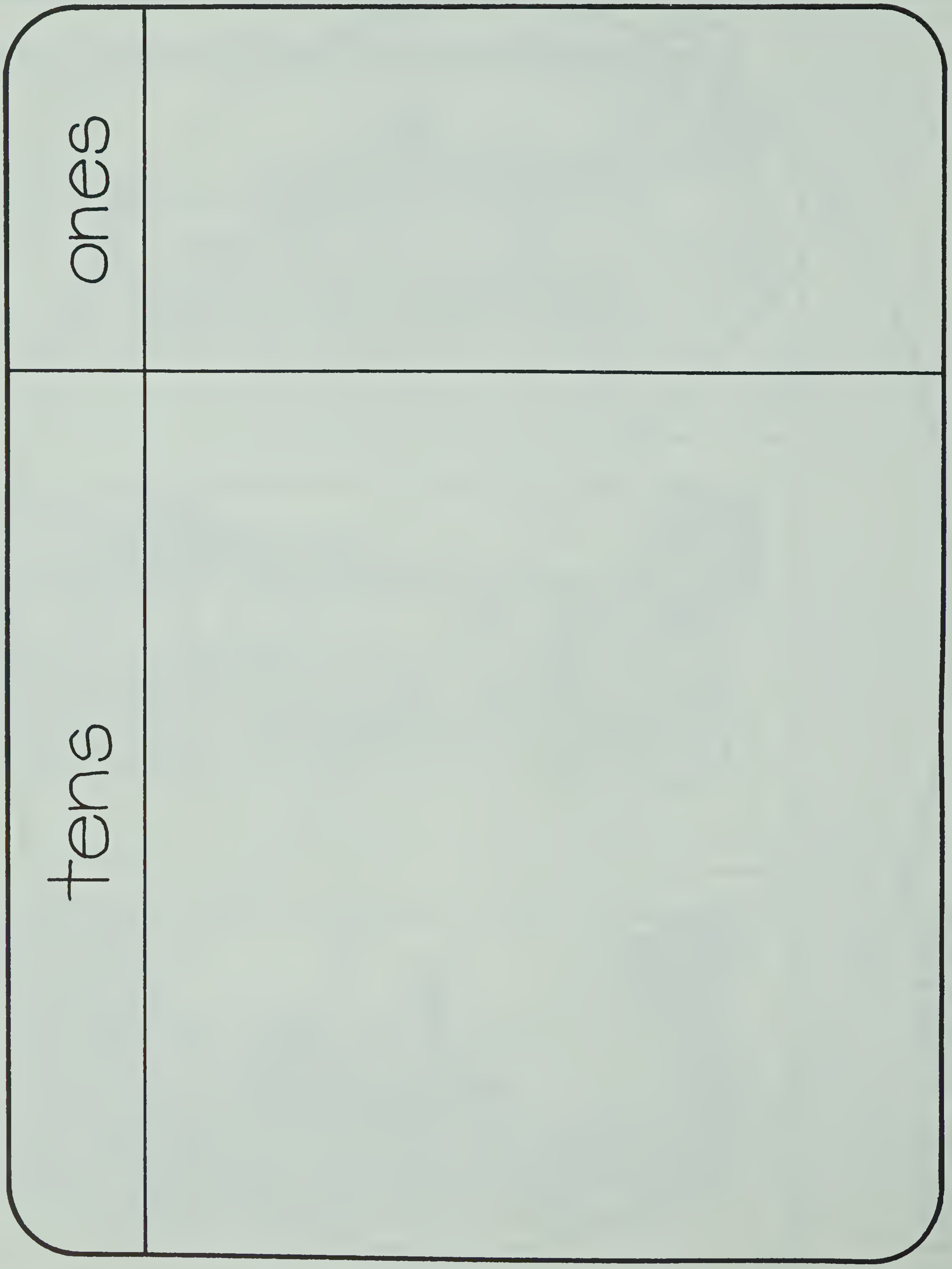
Program Master 16
Place-Value Mat (tens and ones)



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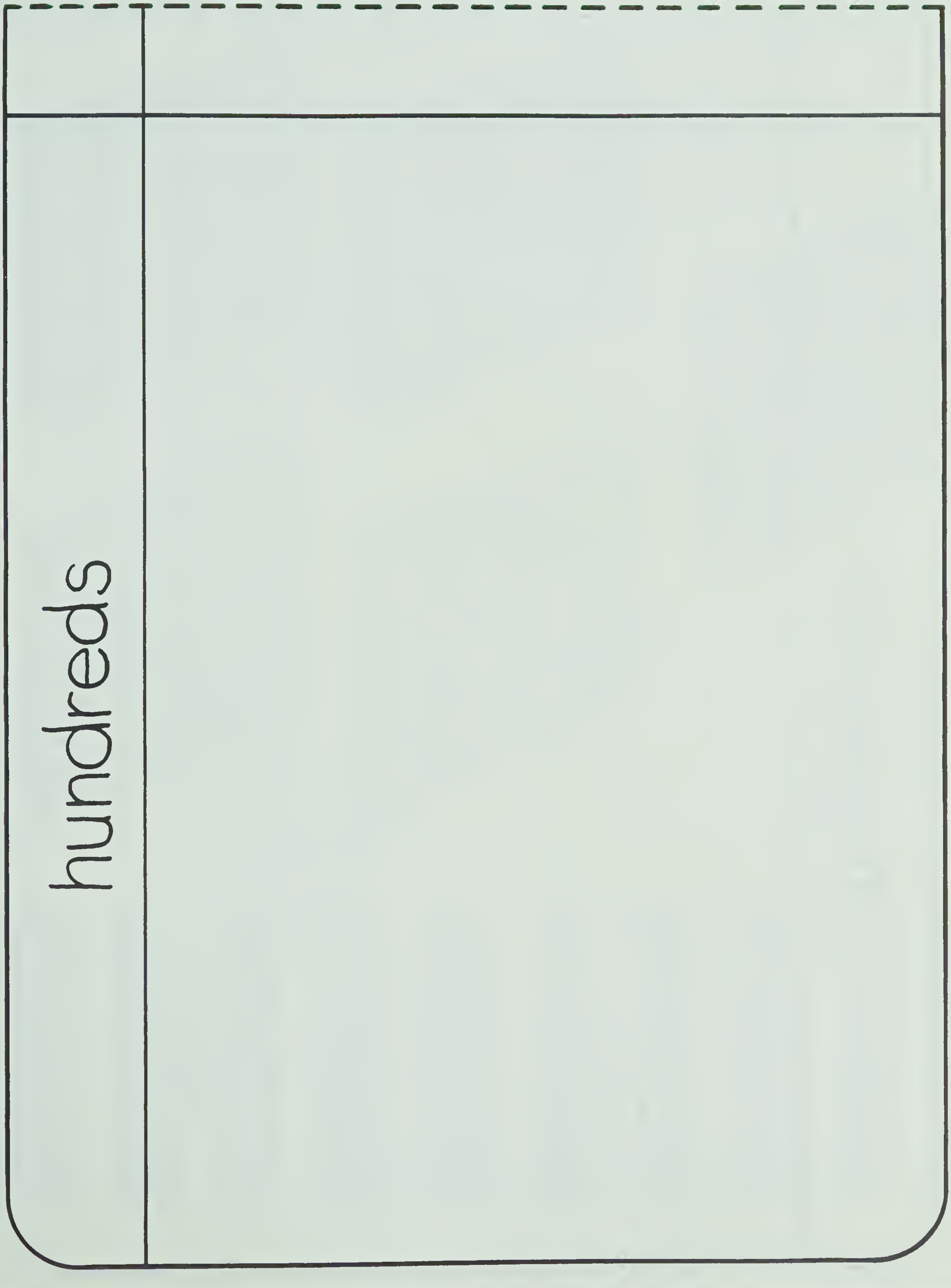
Program Master 17
Place-Value Mat (hundreds)



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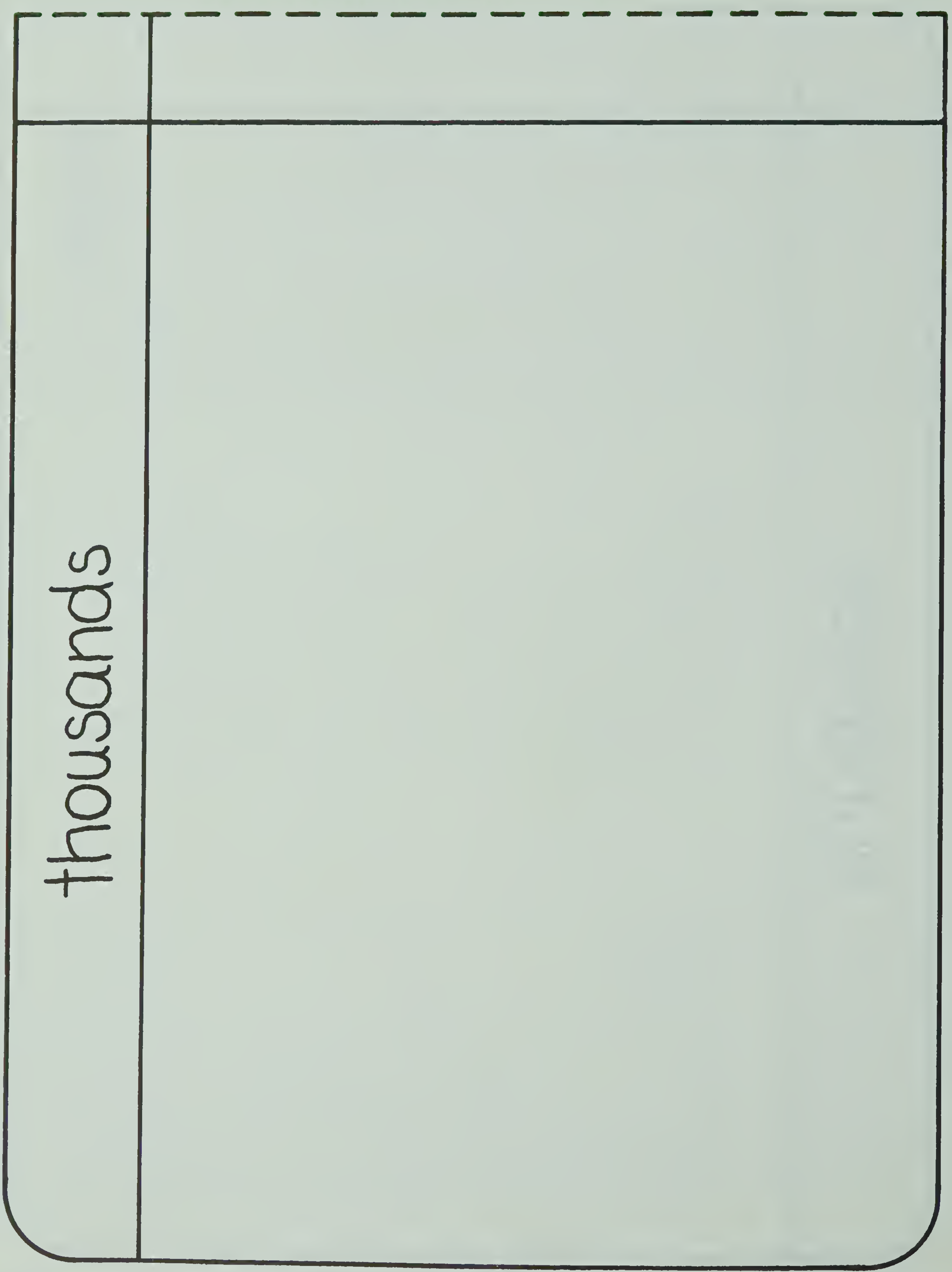
Program Master 18
Place-Value Mat (thousands)



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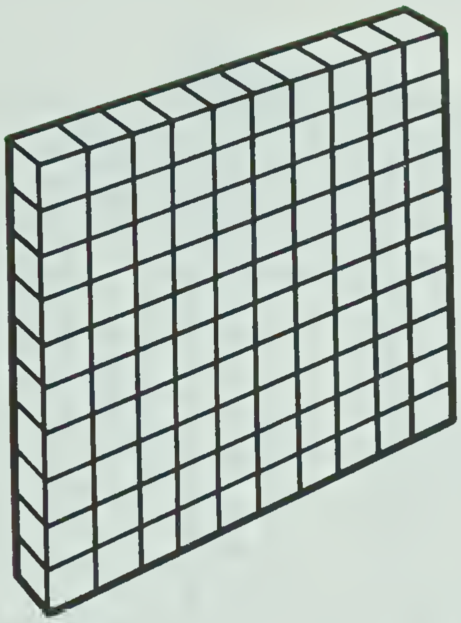
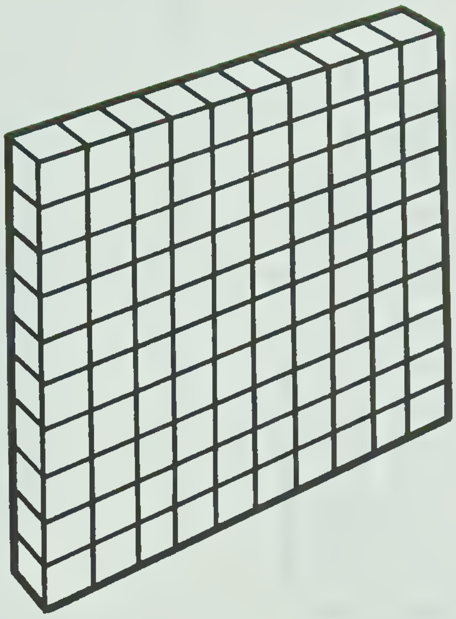
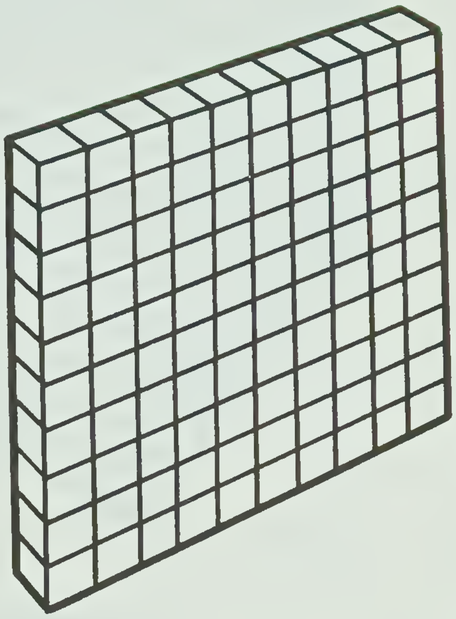
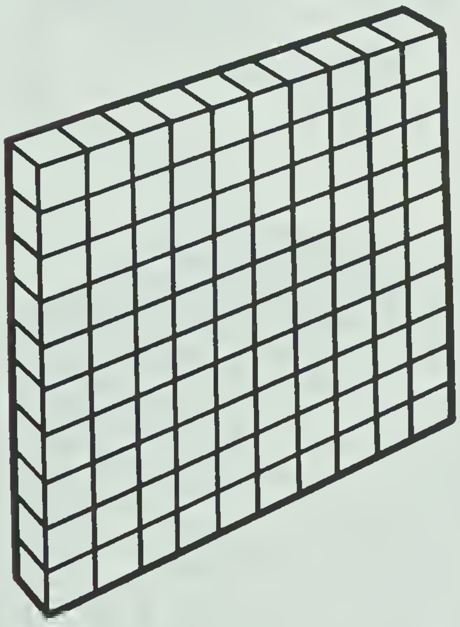
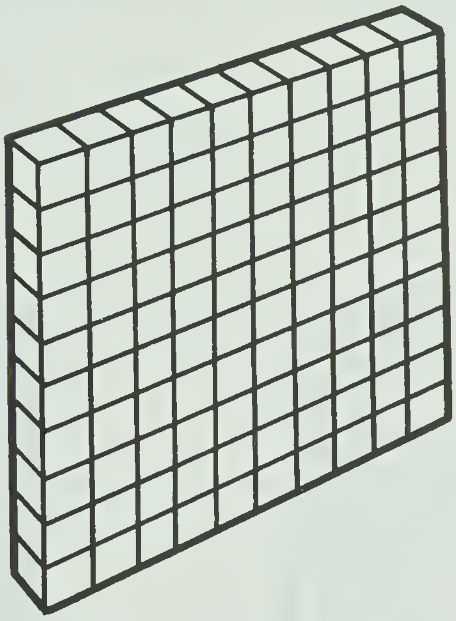
Program Master 19
Place-Value Materials (10-strips and hundreds)

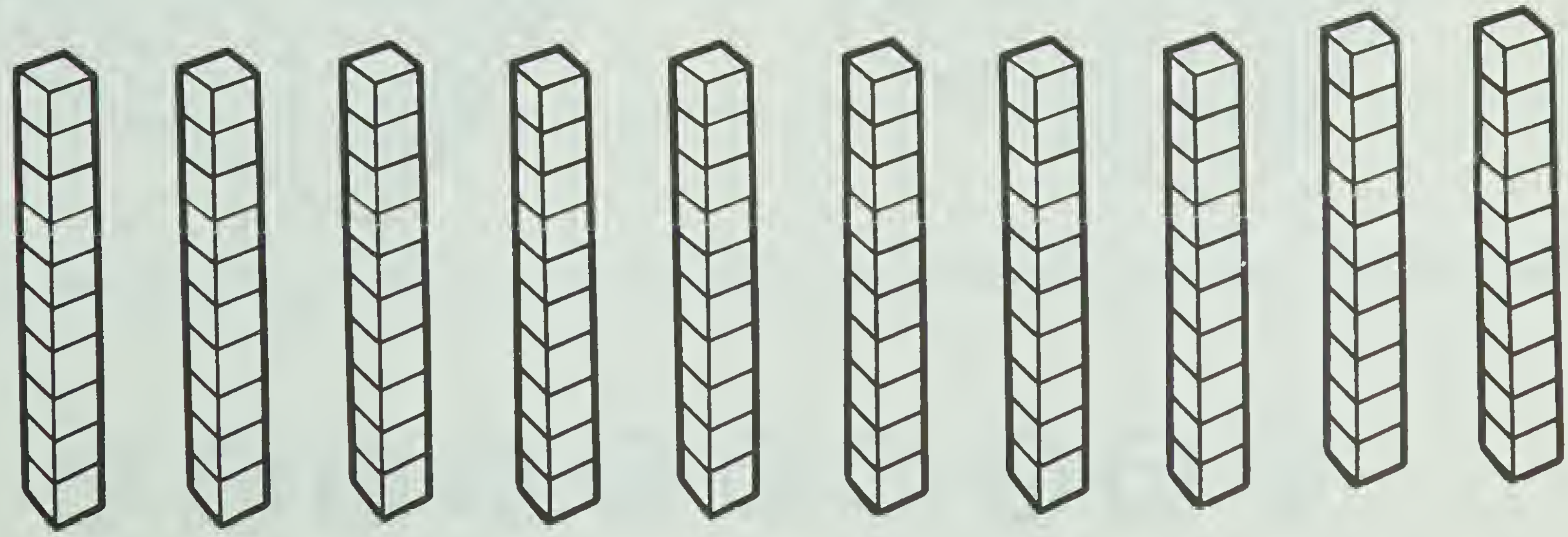












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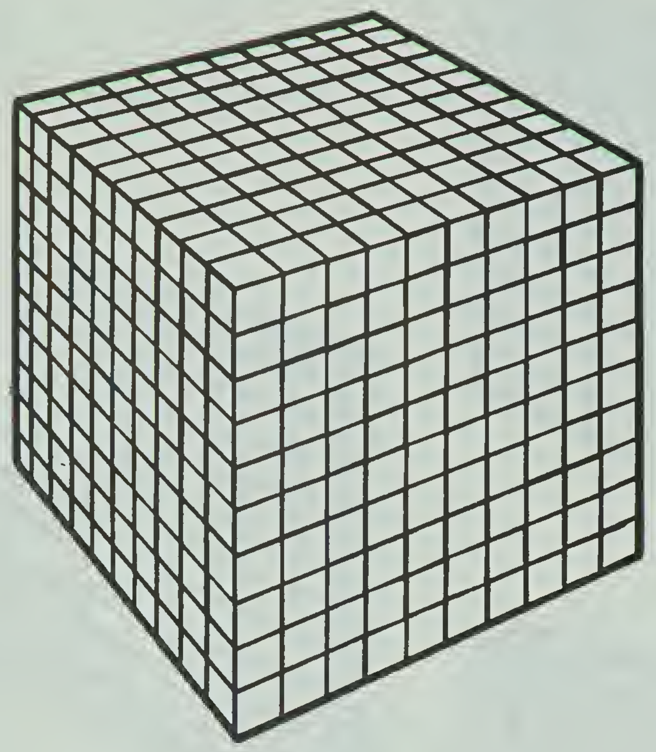
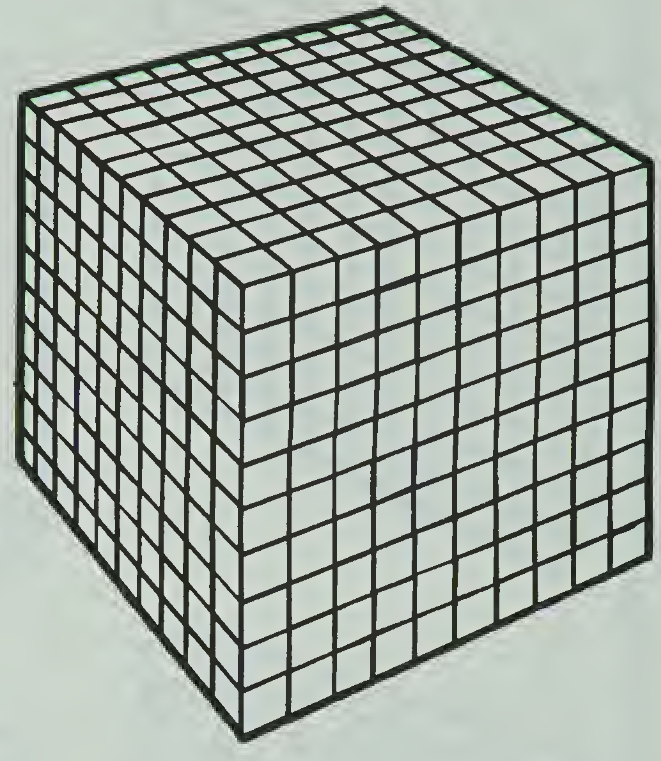
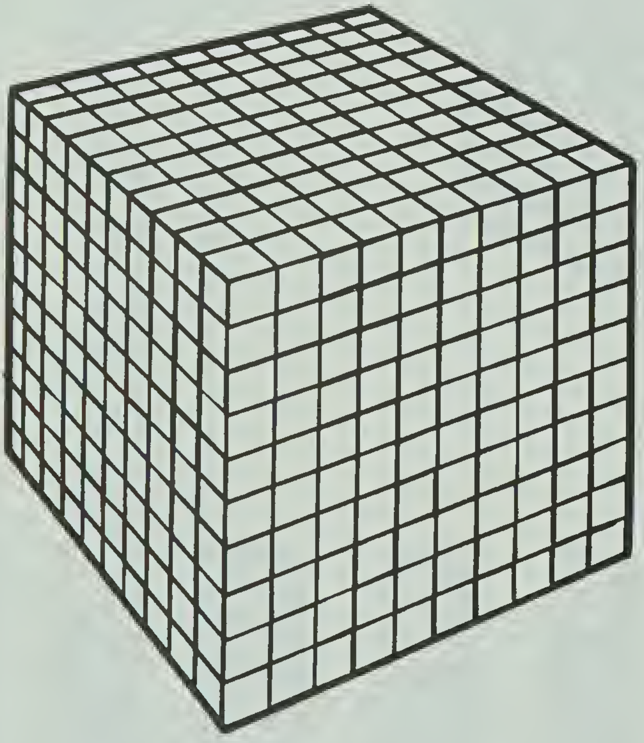
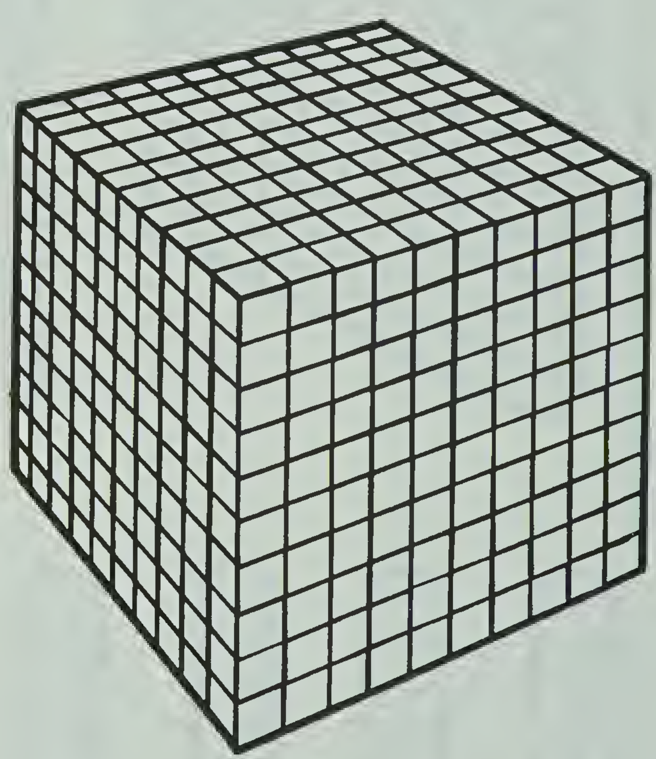
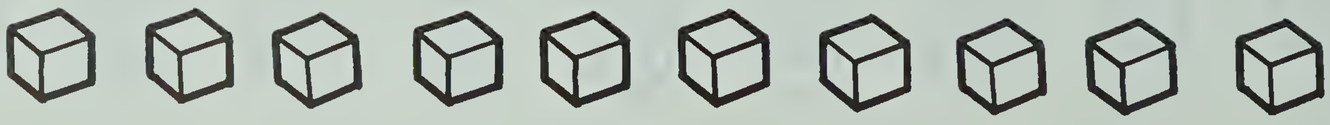
Program Master 20
Place-Value Materials (unit strips and thousands)











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Program Master 21
Blank 100-Chart

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Program Master 22
100-Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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Program Master 23
Addition Chart

+	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

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Program Master 24
Multiplication Chart

×	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

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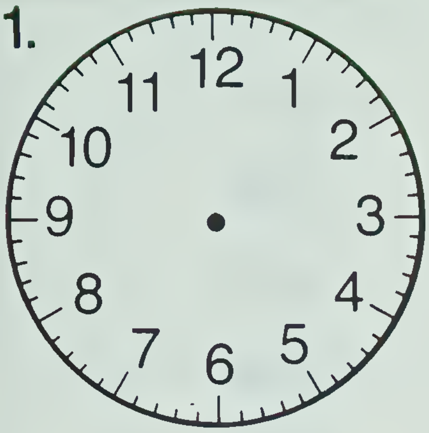
Program Master 25
Clock Faces

1.



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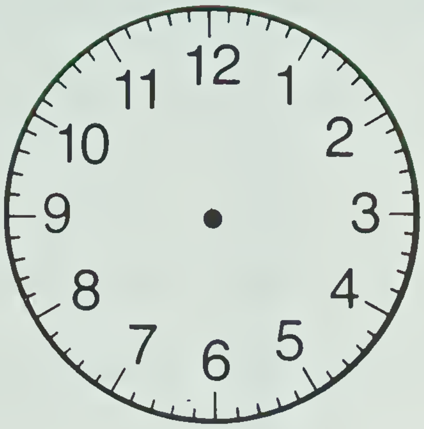
2.



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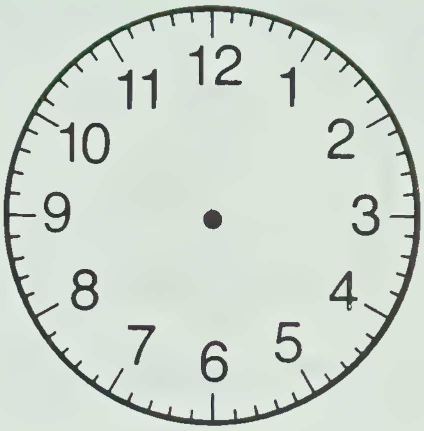
3.



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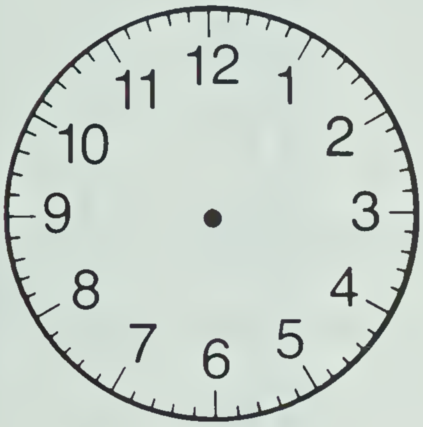
4.



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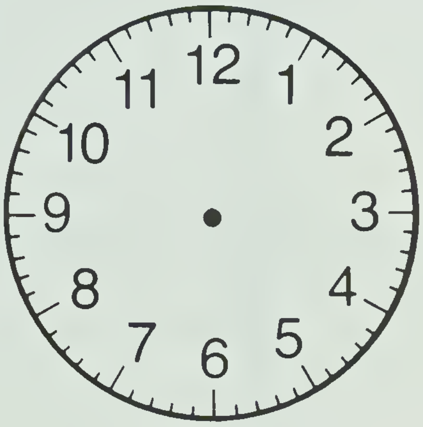
5.



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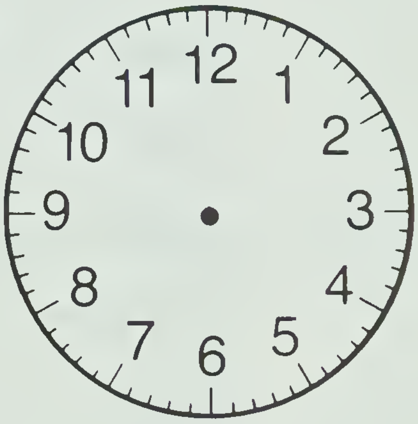
6.



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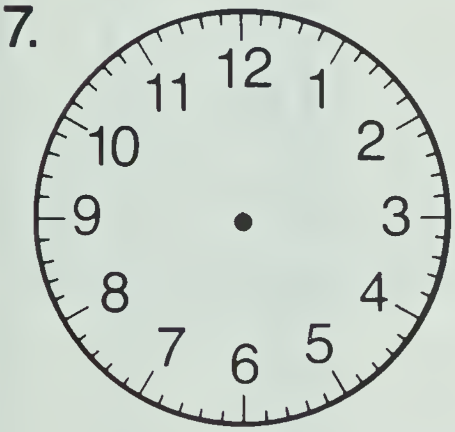
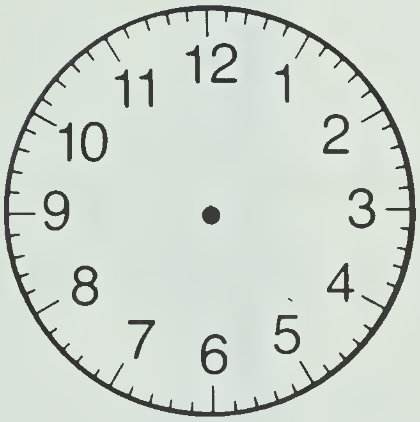
7.



____

8.



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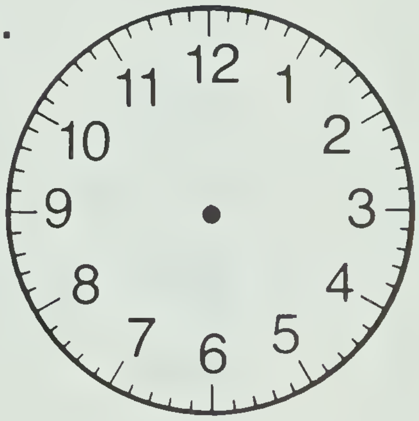
9.



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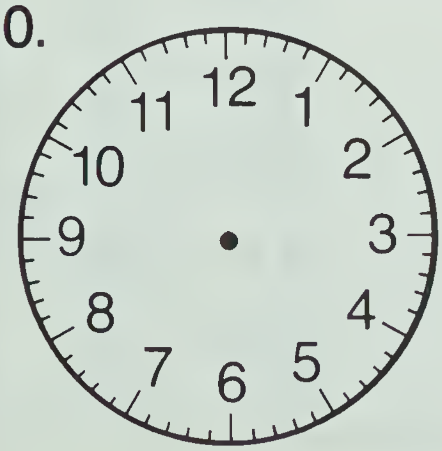

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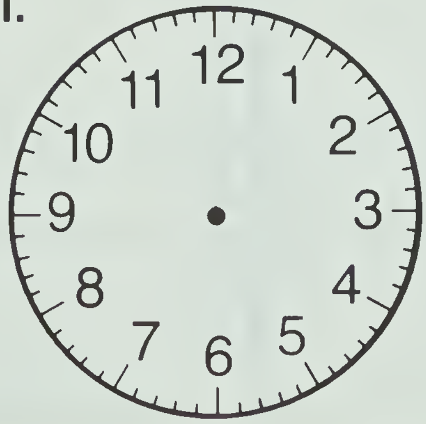

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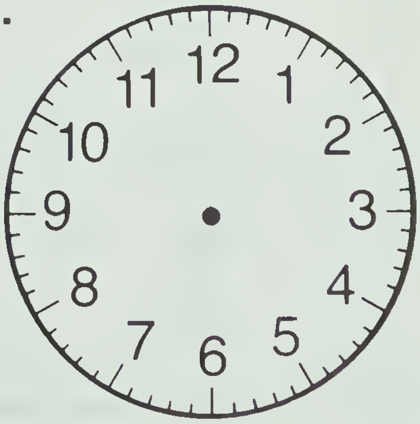

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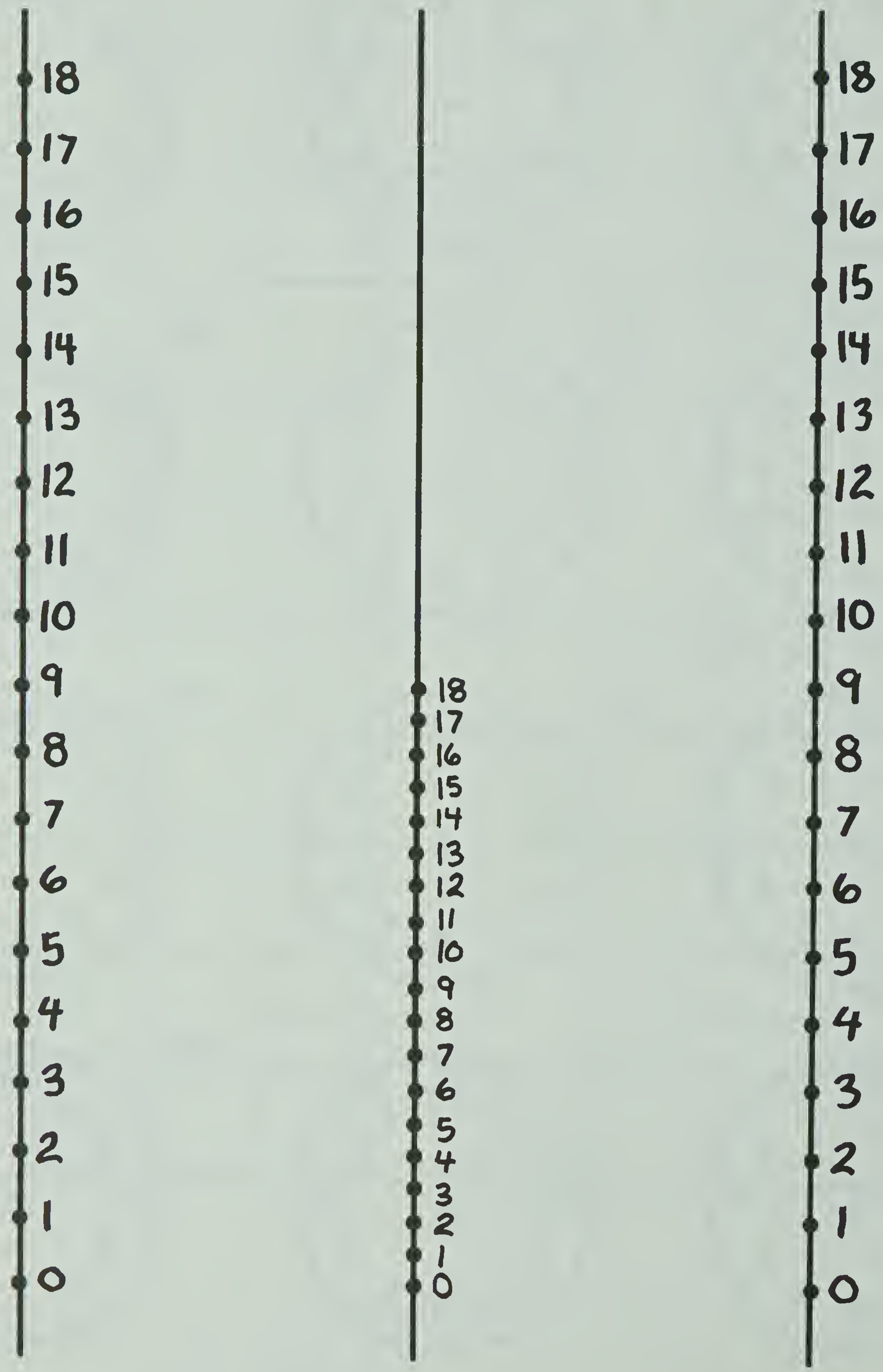
Program Master 26
Nomograph



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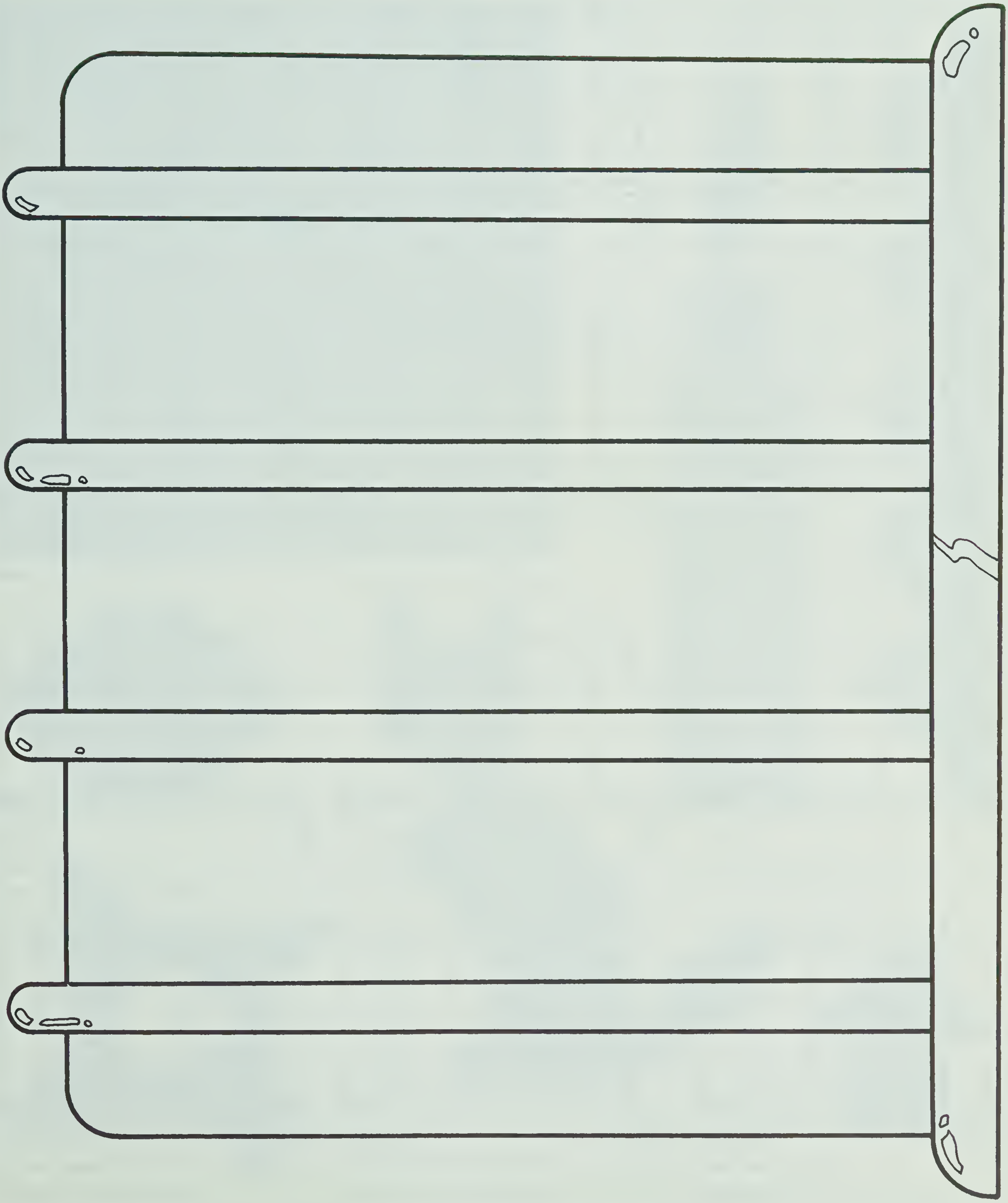
Program Master 27
Abacus



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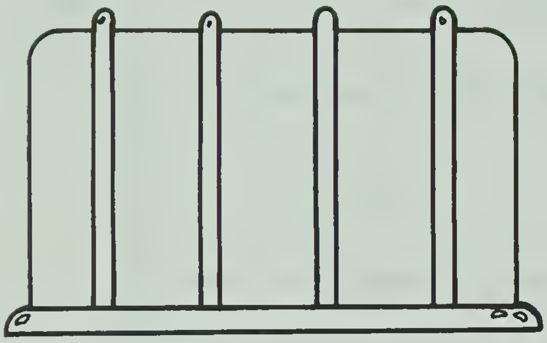
Program Master 28
Abaci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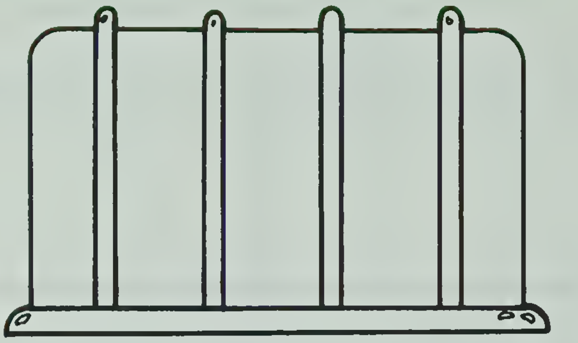
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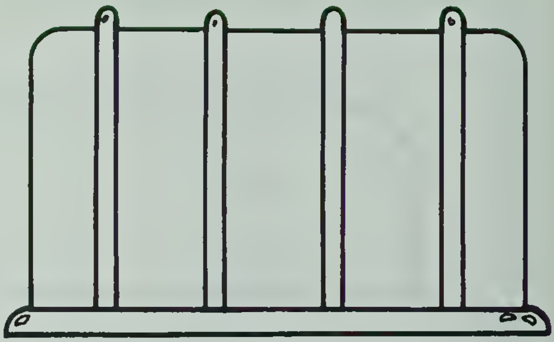
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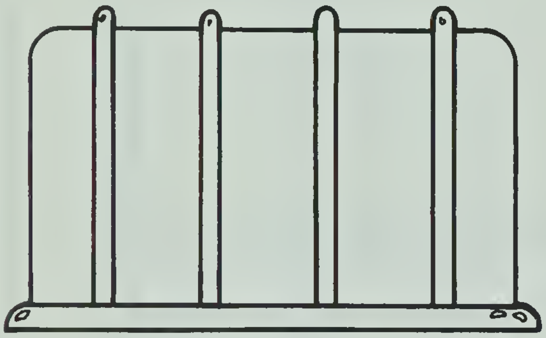
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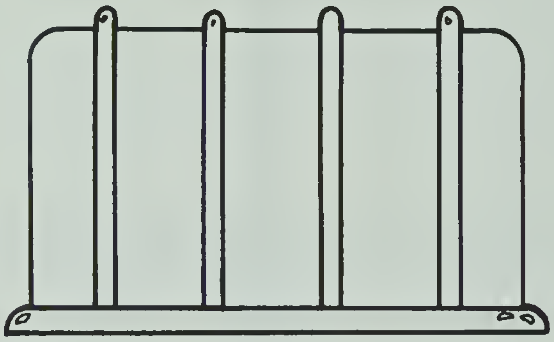
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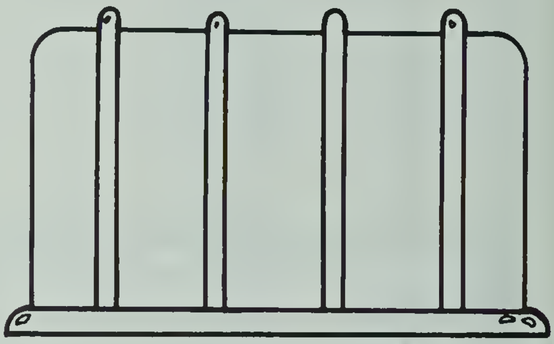
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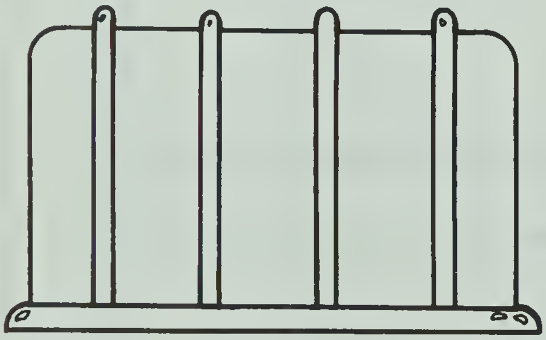
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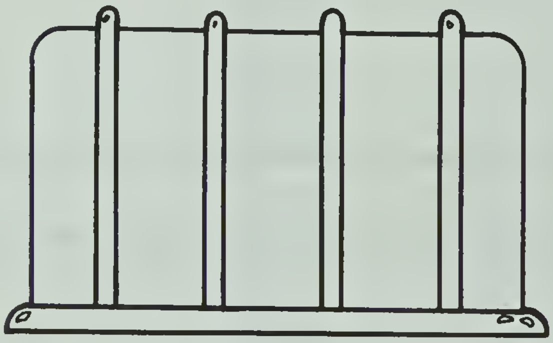
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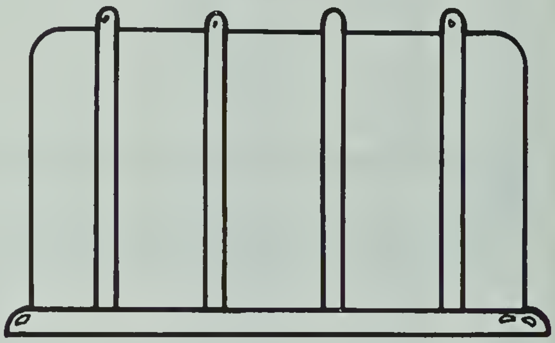
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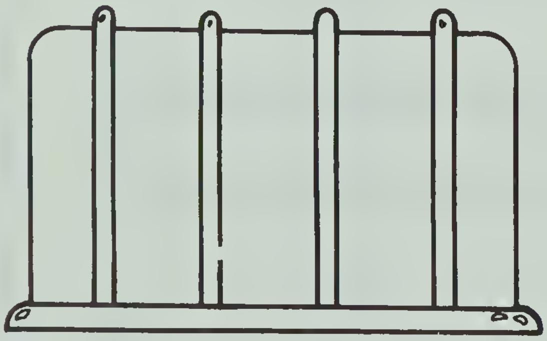
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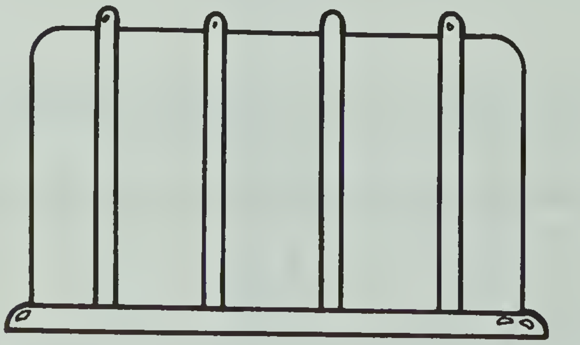
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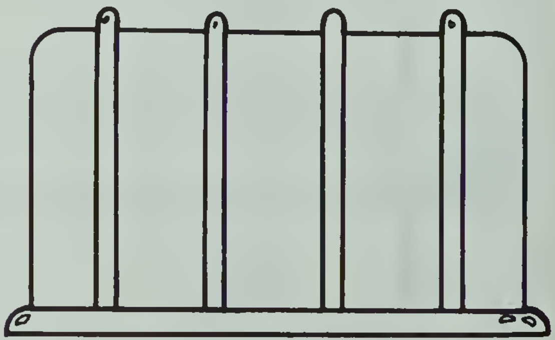
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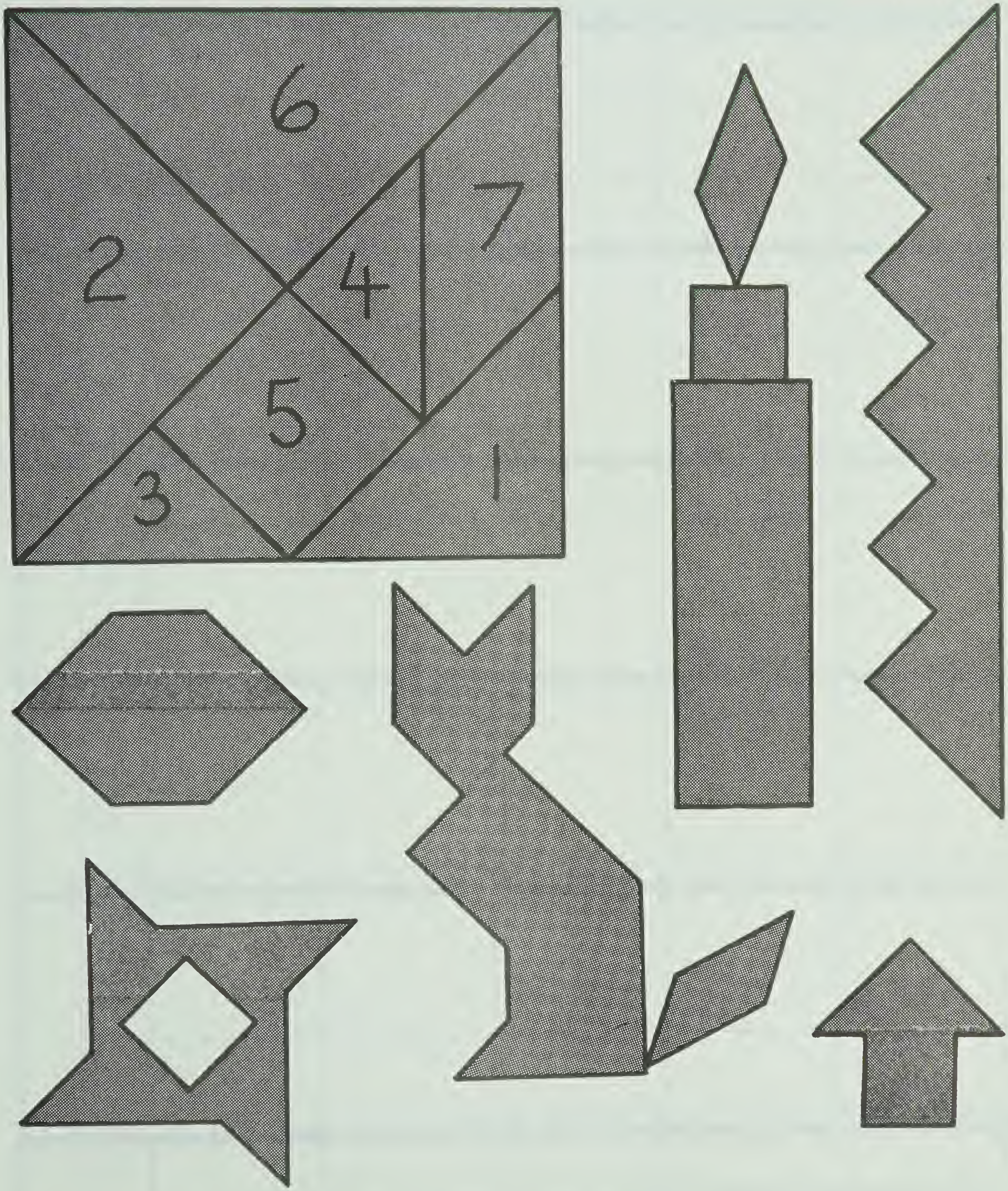
Program Master 29
Tangram



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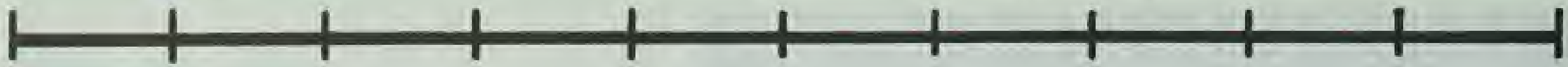
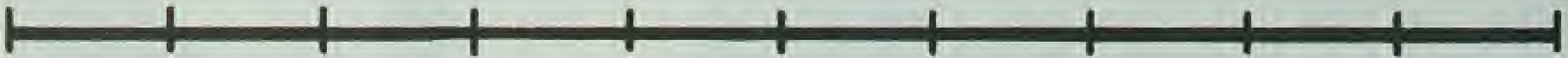
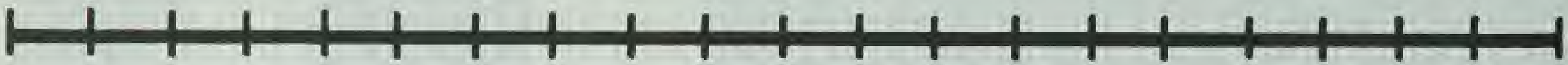
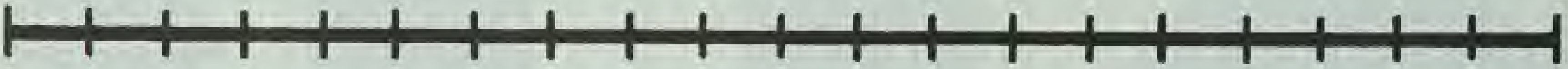
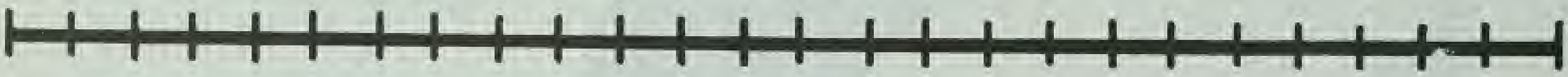
Program Master 30
Number Lines

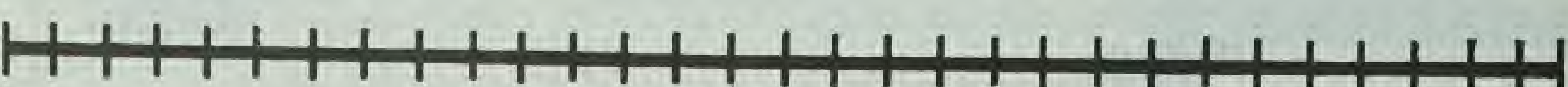












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Program Master 31
Blank Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

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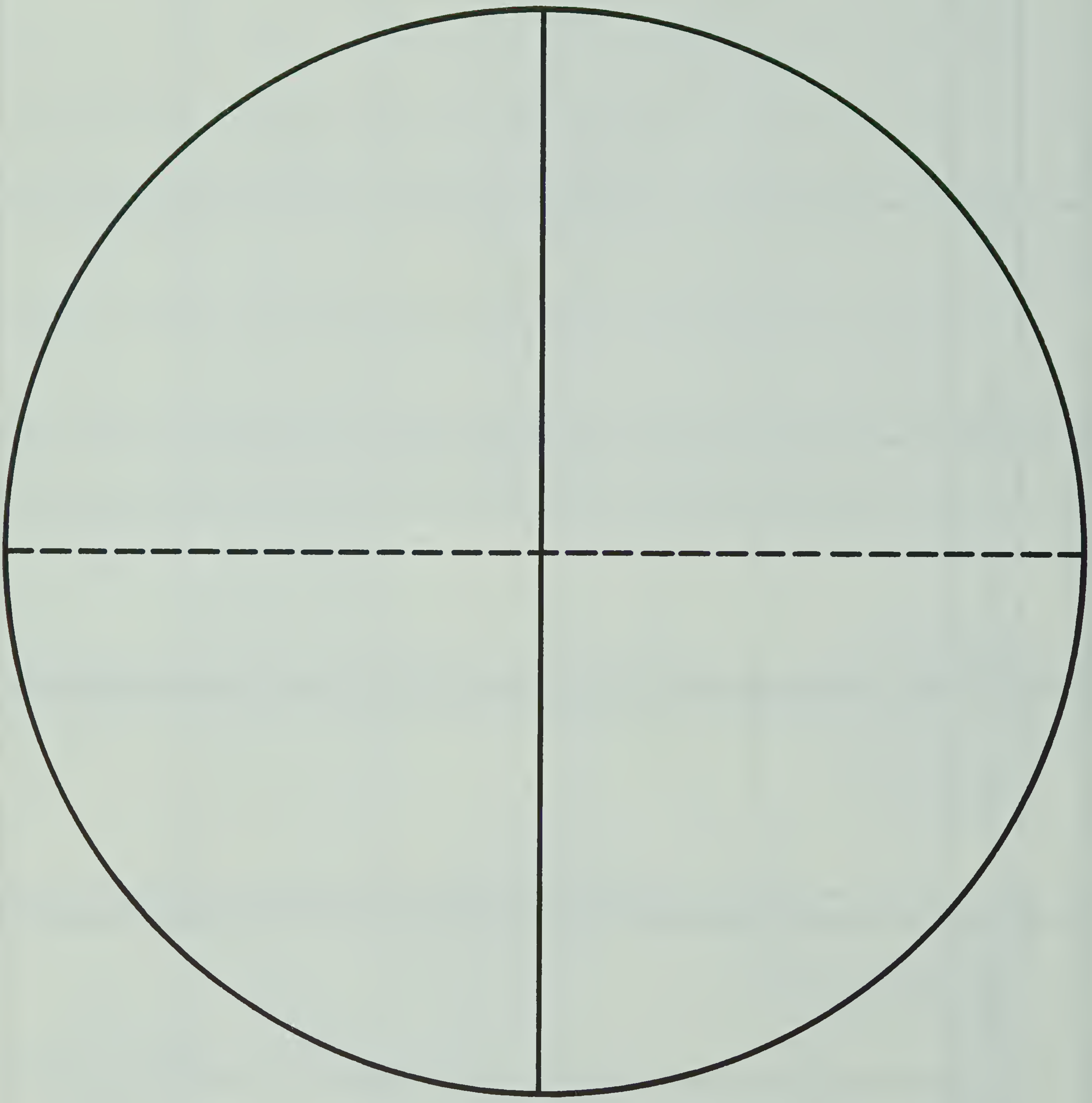
Program Master 32
Fractional Pie (halves and quarters)



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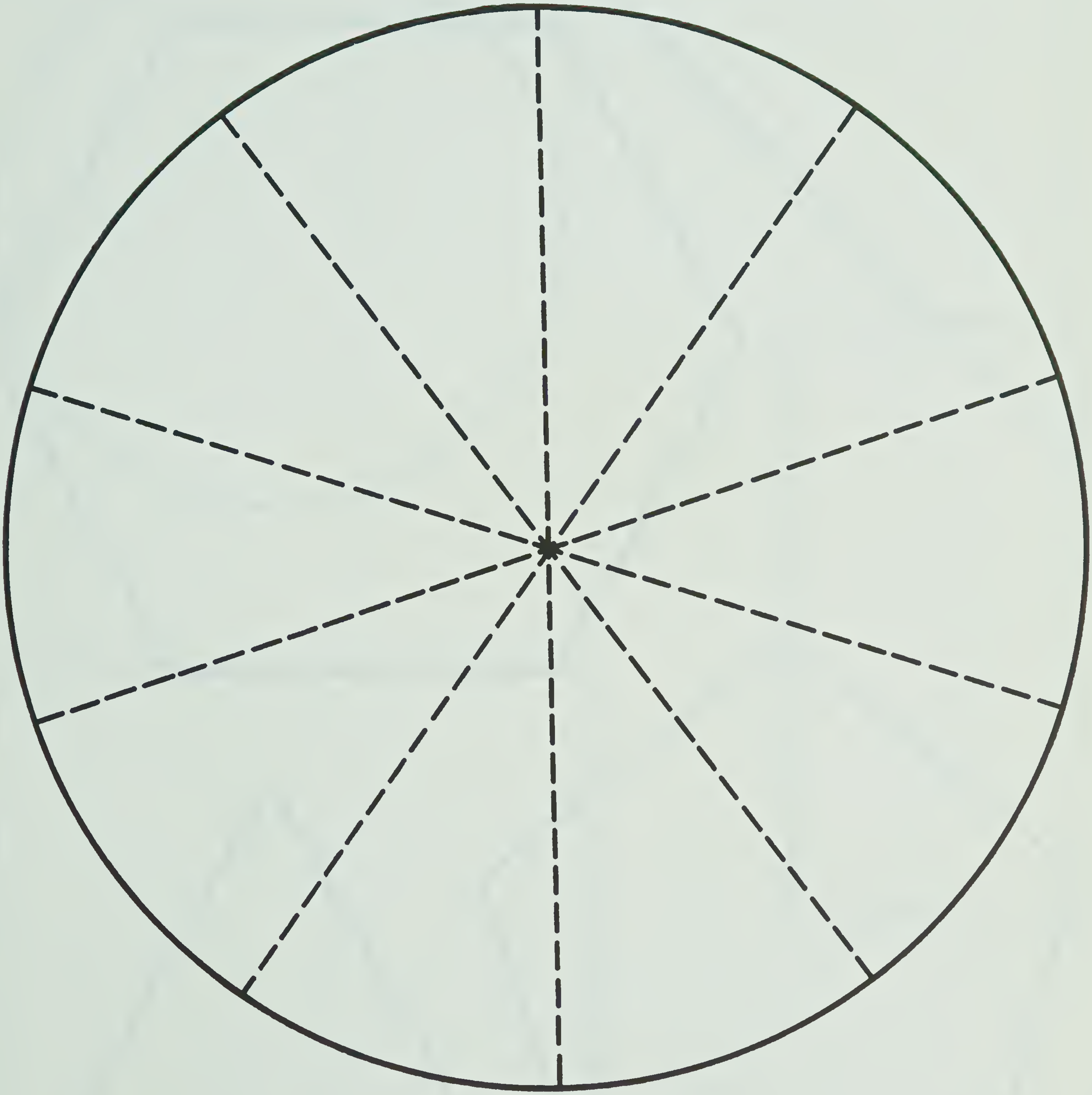
Program Master 33
Fractional Pie (tenths)



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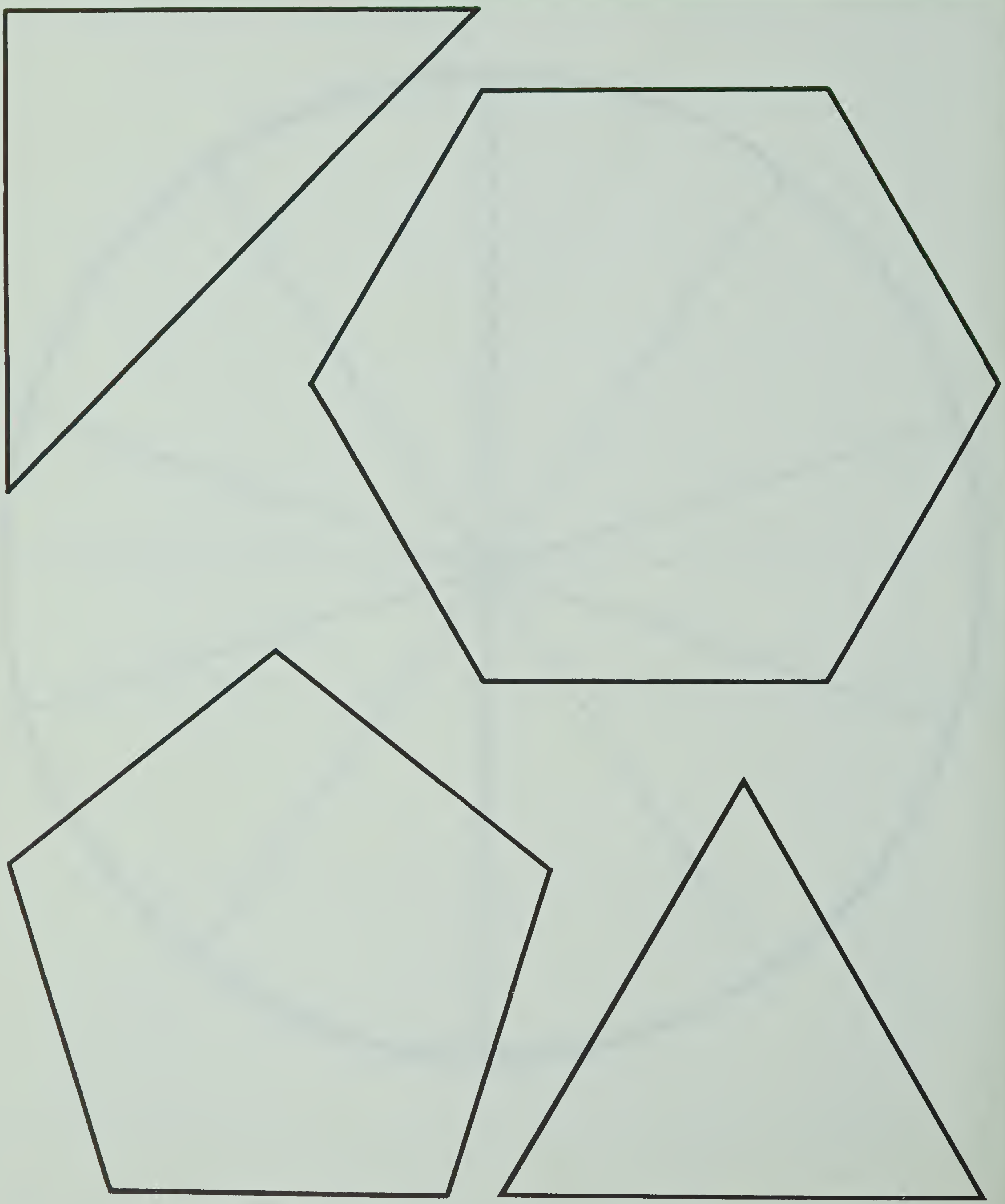
Program Master 34
Two-Dimensional Models



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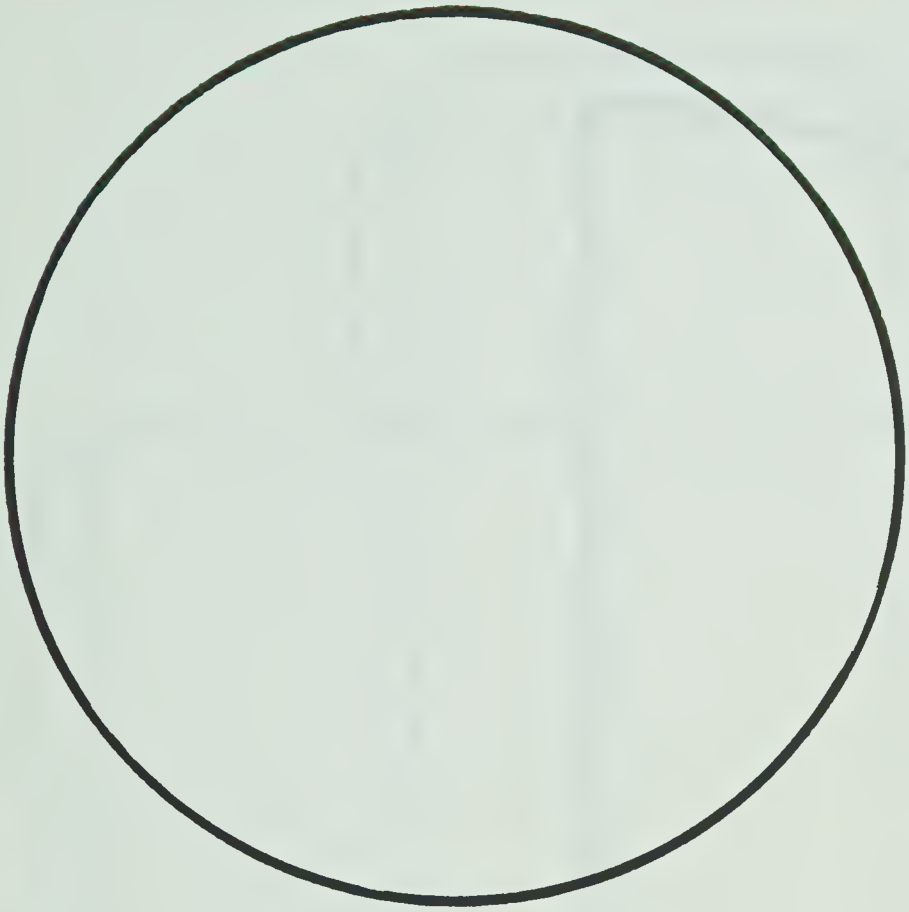
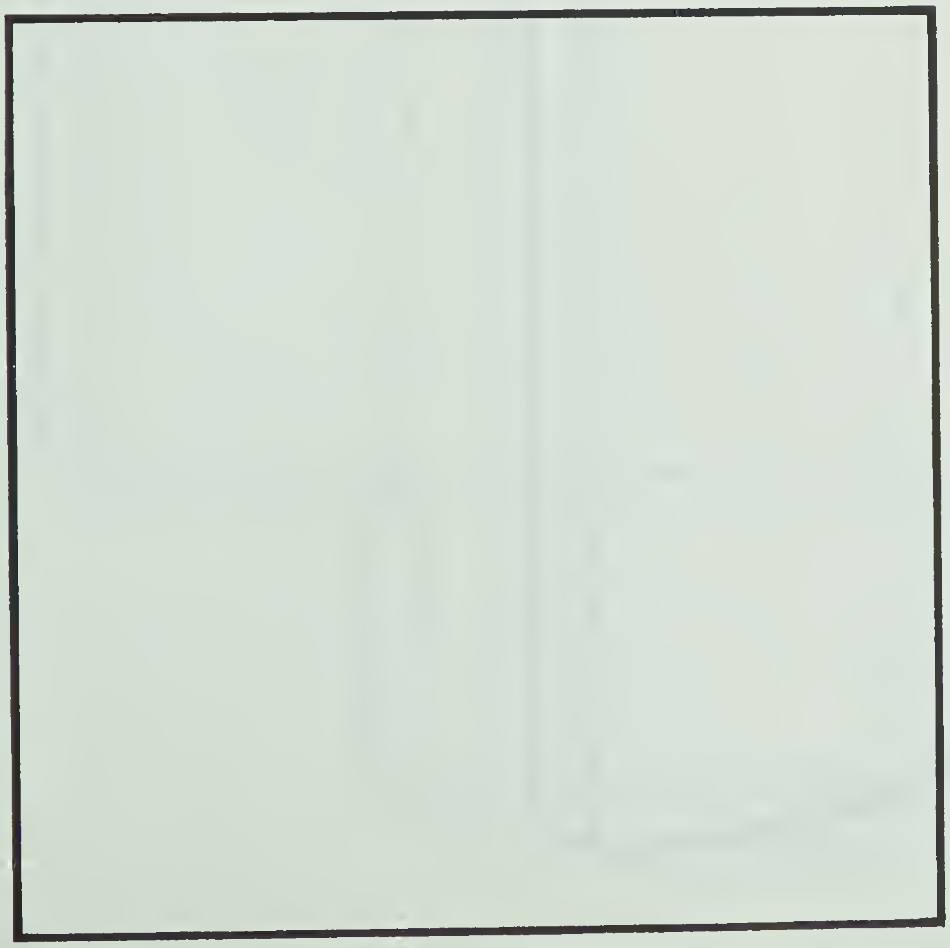
Program Master 35
Two-Dimensional Models





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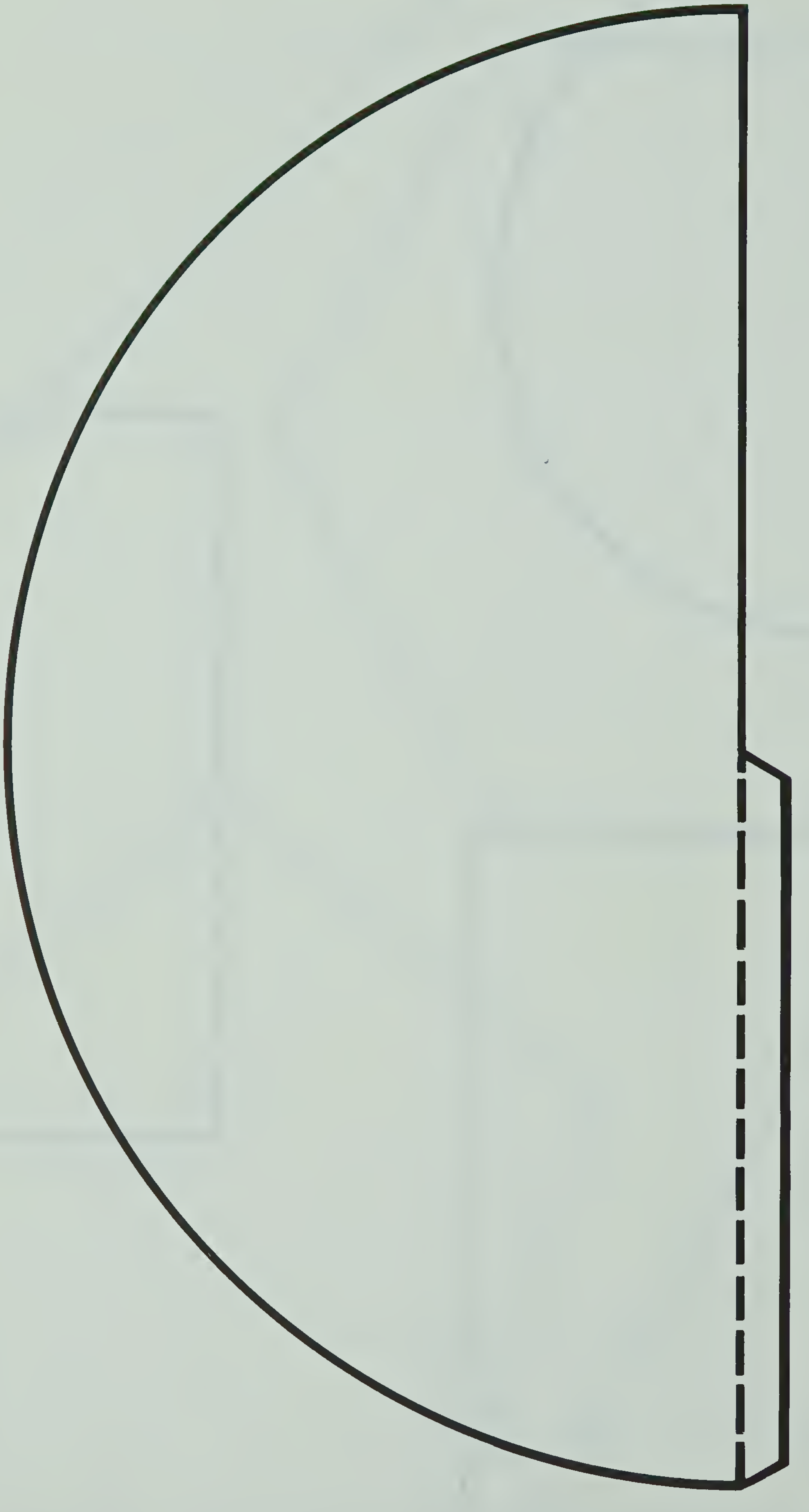
Program Master 36
Net of a Cone



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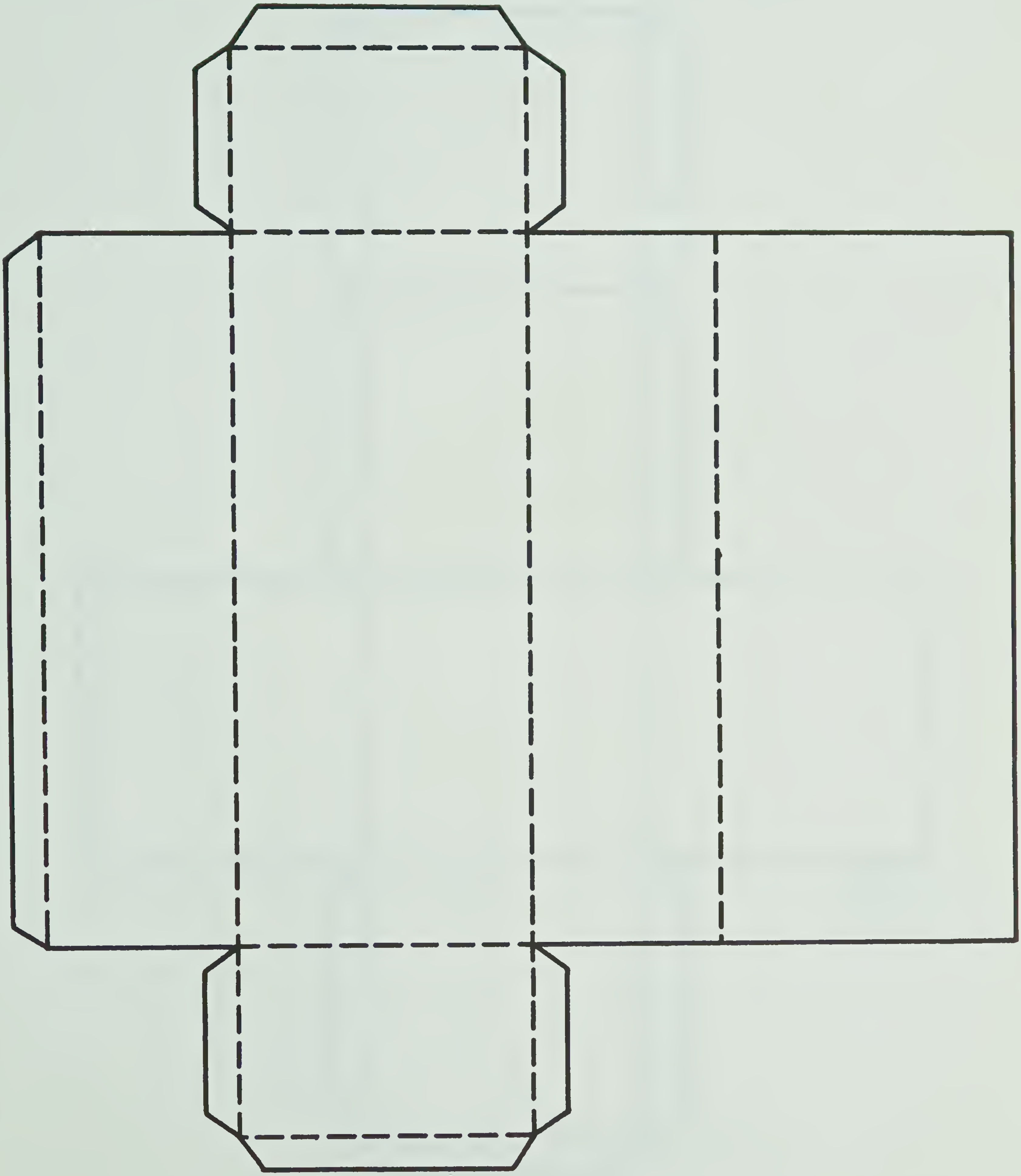
Program Master 37
Net of a Rectangular Prism



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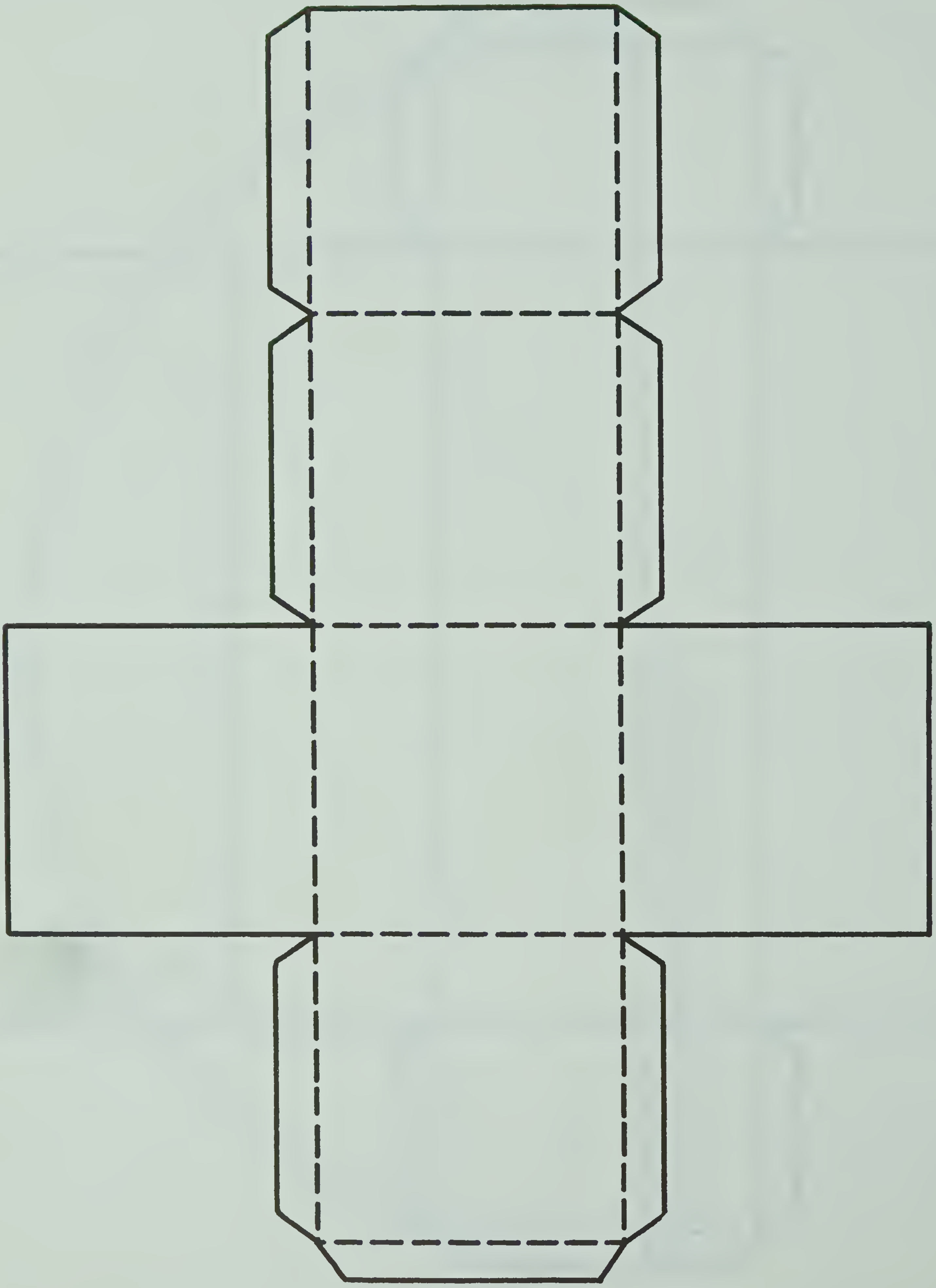
Program Master 38
Net of a Cube



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DATE DUE SLIP

DUE EDUC APR 15 '91	
APR 20 RETURN EDUC OCT 05 '94	
DUE EDUC OCT 19 '94	
RETURN OCT 19 '94	

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